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## Explosions and their Prevention

We have lately had cause to examine the literature of the past few years relating to accidents due to explosions. Our search led us, amongst other places, through the abstracts of chemical literature, and we were struck by the comparative rarity of any reference to specific industrial or laboratory accidents, although such accidents must occur quite frequently throughout the world. Unless a public inquiry is held firms are frequently not desirous of publishing details because such details may, in their opinion, give away some of their supposed manufacturing secrets. An instance came to our notice in which a firm in a highly competitive industry in America invites its competitors to send representatives to help unravel any untoward occurrence of this character in order that methods of prevention that may be applied shall be available for the benefit of all. Accident prevention should be regarded in a similar light to medical science in that knowledge gained should be as widely disseminated as possible in order to avoid similar occurrences elsewhere.

High pressure work might be supposed to be the most risky of all and that in which accidents due to explosions would be most frequent, but it is not so. Sir Gilbert Morgan has stated publicly that throughout 11 years' work with "home-made" plant working up to 3,000 atmospheres there has never been a serious accident in high pressure work at Teddington, this being due to his recognition of the principle that in explosions "absence of body is better than presence of mind." Every care is taken to protect those in the vicinity, acting on that golden rule of Sir Richard Threlfall that: "The only way to use high pressure plant is to recognise that if it is used long enough, sooner or later it will blow up." Whilst recognised high pressure plant is usually well protected, similar care is not usually taken with such "intermediate" apparatus as explosion bombs for calorific value estimation, and we have heard of instances wherein chemists have been fortunate to notice a minute leakage of gas indicating a crack and to take cover a fraction of a second before the laboratory was wrecked. On two instances we have witnessed (once from a distance of 12 inches) the explosion of an entirely unprotected sodium peroxide calorimeter. Laboratory explosions are due to lack of care and to lack of knowledge. Sometimes the lack of knowledge is general as in the case of di-isopropyl ether that is the subject of comment in another column; but often they are due to ignorance.

Explosions have occurred in many ways. A fairly frequent cause is that of opening  $\text{CaC}_2$  drums with a chisel, when an acetylene-air mixture already in the drum explodes. The explosion of ether residues above

100° C. is also frequent and is caused by peroxides originally present in the ether formed by the action of light or aldehyde on the ether—always test ether for peroxides before use! Corrosion of apparatus, particularly of large-scale apparatus, is a prolific source of trouble and may occur in unsuspected ways, as in one instance recorded of a lead boiler containing a coil in which thermoelectric currents were set up by the difference in temperature between the lead and the coil. Concentrated perchloric acid heated with metallic bismuth led to another explosion. The preparation of an ammoniacal silver solution is now known to cause grave explosion hazards by attempts to dissolve precipitated silver hydroxide in ammonia. The explosion of solvents owing to the development of static electricity is now well known also. Static electricity may develop in a liquid (particularly a non-conducting liquid) flowing through pipes, air, or other gaseous media, or in vapour issuing into air or other gaseous medium, or gas passing into a solvent. A jet of hydrogen issuing into the air may ignite spontaneously if there are dust particles in the hydrogen which become electrically charged. The alkali metals may act as powerful detonators with organic halogen compounds. Naphthalene dust has been known to explode when filling a sulphonation tank, due to the development of static electricity.

Modern industrial conditions have been complicated by the liability of finely divided substances to cause severe explosions under comparatively slight influences. Occasionally the violence of the explosion is far beyond what would be expected from the general nature of the material. In a Bureau of Mines investigation, powdered starch was fired and caused an explosion of unprecedented violence so that the experimenters, who regarded themselves as being at a safe distance, narrowly escaped serious injury. An explosion occurred in a room in which aluminium ware was being polished. The air contained fine aluminium dust which was apparently ignited by the spark from a defective connection. Flour mills have been exploded with complete destruction by the accidental ignition of flour dust. Not long ago a gasholder was being demolished without being sufficiently purged so that an accidental spark caused by a blow with a hammer permitted the demolition of the holder with quite unforeseen celerity.

The foregoing are just a few of the explosion hazards run by industry and may perhaps point to some of the things to be avoided. It is our belief that chemists in general have a wide experience of unusual occurrences which should be made public in the interests of their fellows and we invite correspondence giving particulars of general, or particular, interest.

## Notes and Comments

### Analytical Technique

**I**N this issue of *THE CHEMICAL AGE* there is published a short contribution concerning an analytical procedure for estimating the manganese content in stainless steel. The joint authors have observed some difficulties which confront the analyst, and, by investigation, they have found a way in which those difficulties may be overcome. In other words they have made a discovery, which they have been willing to communicate to a technical paper for the benefit of all who may wish to adopt it. This public-spirited service is not as common as it should be, and we would like to foster it by extending a welcome to contributions based upon personal investigation in the analytical laboratory. Analytical methods, it is agreed, are now extremely numerous and of immense variety. Most probably there is not one day which passes without some discovery being made for the betterment of technique, or greater accuracy in results, or giving some recognised method a much wider application. Elsewhere a brother analyst is waiting for just that particular information, but the "man who has found" and the "man who would go a-seeking" are possibly unknown to each other or, maybe, they are merely unaware that there are certain difficulties and devised methods which are of common interest. It is here that the technical paper serves one of its many useful objects, for although the analyst may read his paper very regularly, he is considerably less active in contributing to it.

### Di-isopropyl Ether

**F**OR the sake of chemists who may not have seen it, we call attention to a recent communication from Dr. R. H. Pickard and Sir Gilbert T. Morgan referring to two serious explosions in their respective laboratories, one attended by consequences so serious that a worker "has practically lost his sight." On the first of these occasions, that which was attended by the more serious consequences, a sample of di-isopropyl ether was purchased in the usual way from a firm of chemical factors and was used several times immediately. During the next six months some 500 cc. was used for the extraction of acetic acid in quantitative determinations of the acetyl group in cellulose acetate. Many extractions were made and much of the ether recovered. Some six years later, there was occasion to use the material again. There were two bottles, one of which contained the recovered substance and the other the original di-isopropyl ether. From one of these bottles, but from which is not known, 100 ccs. was taken and distilled from an electrically-heated water bath. The water bath still contained considerable water after the occurrence, showing the temperature not to have exceeded 100° C., but as the liquid was not boiling smoothly, the operator shook the flask gently to remove any superheating, whereupon a violent explosion took place which shattered the flask. In the second accident a sample of di-isopropyl ether five years old was being distilled after use in extracting organic acids from an aqueous solution. When the ether was nearly dry, a violent explosion occurred, and would have had the same unfortunate result had not the operator been wearing glasses.

### Unsuspected Hazards

**I**T was found that during standing all three of the samples had developed peroxides which exploded violently upon heating or subjection to mechanical shock. It is clear that whilst freshly prepared di-isopropyl ether can be distilled from a water bath without danger, it is liable to develop peroxides on standing. Old specimens and those of doubtful age that liberate iodine from aqueous potassium iodide should never be used. Removal of peroxides can be safely accomplished by exhaustive treatment with either mercury or aqueous permanganate. Explosions of this unusual nature occur from time to time and it is one of the hazards of the chemist's work that he may unexpectedly meet with a chemical reaction that lies outside the bounds of his knowledge. We recollect an explosion at a hospital twelve months or so ago when a 100 kg. drum of weed-killer exploded on opening, killing two men. For some reason ammonium chloride had been added to the potassium chlorate commonly used in weed killers, forming the explosive ammonium chlorate. The formation of peroxides is always to be feared; is it an especial danger with ethers? Numerous explosions are known of the residue from the evaporation of ethyl ether in which peroxides had been formed on standing by the action of light or aldehydes. It would not be a bad thing if chemists generally would test for peroxides any ether they propose to use. Even that, however, does not exhaust the possibilities of accident from unexpected chemical reactions. We trust that all unusual explosions in laboratories, whether attended by serious results or not, will be reported in the technical Press.

### Sugar Research

**P**OWER has been given to the Sugar Commission by the Sugar Industry (Reorganisation) Act to raise a sum for research purposes to the extent of possibly £70,000 per annum by a levy on sugar manufactured in this country. Before any steps are taken to set up an entirely new research organisation, due regard should be had to the work already successfully carried on by the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades. This association, though mainly supported by the trade's own funds, receives annual grants from the Department of Scientific and Industrial Research and comes under the purview of that Department. Its constitution is such that it is in close touch with manufacturing processes of all kinds and through its advisory panels of chemists and others it is in a better position to know what the trades concerned require than could any outside organisation. The problems which arise in connection with the consumption of sugar in manufactured articles are many and various, but Mr. J. G. Mathieson, president of the Research Association, contends that the setting up of any fresh organisation to deal with them would be liable to cause over-lapping and waste of effort. Not less than a fourth of the new levy, if it is made, will be raised on sugar used by trades and businesses which are already supporting the Research Association. Obviously the case is one in which some amount of co-ordination appears to be called for.

## The Colour Users' Association

### Sir Henry Sutcliffe Smith Reviews the Year's Work

**O**UTSTANDING events in the colour using world during the past twelve months were reviewed by Sir Henry Sutcliffe Smith in his speech as chairman at the annual meeting of the Colour Users' Association held at Manchester on Tuesday. The dermatitis committee had continued its work, he said, and its interim report had been circulated. There was no doubt that the present decisions of the courts in dermatitis claims left producers of textiles with a strong sense of injustice, seeing that medical opinion was becoming increasingly definite that dermatitis was due to a peculiar idiosyncrasy of the individual, and that the causative agent of dermatitis in the individual might be one of an enormous range of articles such as foods, drugs, soaps, dyed and undyed textiles; yet it would appear that the only suppliers mulcted in damages in these claims were the unfortunate suppliers of textiles, notwithstanding that analytical evidence might be produced that the article was properly dyed, also that similar articles to that alleged to have caused the dermatitis might be worn with perfect immunity by thousands of other individuals.

#### Scientific Study of Dyeing Processes

The British Cotton Industry Research Association at Shirley Institute had devoted an increased proportion of its resources to the scientific study of the dyeing process, and its contribution to this problem would be of considerable value. He had referred last year to a development of certain synthetic resins, and this work was enabling them to visualise astounding commercial possibilities. Experiments at Teddington had shown that a combination of certain synthetic resins could be used for removing dissolved solids, hardness, iron, and other metals from natural water. Sea water might even be freed from salt and other dissolved solids by a more prolonged treatment. It did not need much imagination to realise the possibilities of such a discovery for the dyeing and many other industries. Great advances had been made by the investigation of the possibilities of working at high temperatures and high pressures. This work was already resulting in the production of organic compounds of various kinds, for instance, acetic acid from methyl alcohol, etc., and there were many similar instances which might result in the production of such chemicals at a less cost.

Having referred to benzol on many occasions, it was interesting to him to note the following remarks of Major L. B. Holliday, the other day: "The price of benzol will have a great bearing in the future on the progress of the aniline dyestuff industry of this country; the fact that the dyemakers have to pay the equivalent of the duty on petrol when purchasing benzol is an obvious handicap which should be remedied." Major Holliday had brought the matter before the Dyestuffs Industry Development Committee and that committee was devoting attention to the subject. As this country possessed the best coal in the world, yielding very favourable amounts of tar products per ton, it was necessary that this fact should be thoroughly exploited and every possible benefit derived from it. It was to be hoped, therefore, that efforts would be made by the tar distillers and coke oven owners to extract fully all the products from the coal and from the tar which were the foundations of the aniline dye trade.

#### Record Output of Dyewares

During 1935 the output of British-made dyewares reached a record, the figures showing a result nearly double that of ten years ago and an increase of no less than 10.9 per cent. over 1934. To have increased the output by nearly six million lb. in one year was an achievement which deserved sincerest congratulations. In addition, the past year had been noteworthy for the intensive research undertaken by all

the British makers, which had resulted in a constant stream of new and improved dyewares and auxiliary products; and also equally important, their services had attained a high degree of efficiency.

Imperial Chemical Industries, Ltd., had made a great advance in the manufacture of existing dyewares and the production of new ones. Throughout the year they had shown a constant endeavour to devise special colours to meet the needs of particular sections of the colour using trades, and great attention had been paid to assisting users in the application and technique of the wares they produced.

The progress made by the Clayton Aniline Co.—the English works of the Swiss dyeware manufacturers—had also been considerable; in fact their production of dyestuffs in 1935 was double that of 1925. L. B. Holliday and Co., Ltd., had also made great headway during the last decade and their output of dyestuffs and intermediates during 1935 showed an increase of 84 per cent. as compared with ten years ago. In the space of these years 47 dyestuffs and intermediates had been removed from the non-contentious list of products as a result of this firm's introduction of equivalent types, the quantity imported of these 47 dyestuffs and intermediates representing a value of £156,900 per year.

#### Increased Exports

Exports of dyewares and intermediates during 1935 showed an increase over 1935 of 12 per cent. in weight and 16 per cent. in value. Although the 1935 tonnage was much below the peak year of 1925, the value of the exports compared with that year increased very considerably. Though the 1935 exports showed a useful increase over the previous year, much leeway had still to be made up before we could look upon our export trade with real satisfaction. During 1935 Japan practically doubled her 1932 exports of dyestuffs; the United States increase was 21 per cent.; Germany 16 per cent.; and Switzerland 2 per cent. for the same period.

The Dyestuffs Advisory Licensing Committee figures showed that the I.G. and the Swiss makers of dyewares had practically kept up their trade with this country both in weight and value, notwithstanding the handicap to them of the Dyestuffs (Import Regulation) Act. During the past year both the I.G. and the Swiss manufacturers had devoted an enormous amount of money and time to research. The I.G., for instance, having connections all over the globe, studied the world-wide and varied problems of their customers and consequently their researches had a clearly defined direction; and as a result they introduced during the past year well over a hundred new dyestuffs and dyeing auxiliaries. Some of these constituted improvements over older types, and all had undoubtedly filled a certain want in one part of the world or another. The Swiss manufacturers, working on similar general lines, had concentrated their energies in the production of colours of outstanding fastness, mainly in the fast alizarine and chrome range, and thus had been able to maintain their volume of exports to the United Kingdom. Some of their colours had involved a considerable amount of research, as many of them were highly complex organic compounds. They had also introduced a series of so-called micro powders, which could be used not only in dyeing but also in printing.

#### World Production of Coal Tar Dyestuffs

World production and distribution of coal-tar dyestuffs increased substantially during 1935, and while the data was not yet complete it was estimated that the world output of these products during last year was from 10 per cent. to 15 per cent. greater than in 1934. Germany, the United States, Great Britain, Soviet Russia, Japan, Italy, France,

Switzerland, and Poland were now the world's leading producers of coal-tar dyes and the progress made by these countries in their efforts to develop their dyemaking industries had been one of the outstanding features of the past decade.

It was quite time the dyeware manufacturers, both British and foreign, made a real effort to bring their prices down to a level more in accordance with the wholesale commodity figure, which was now 110.1, as compared with a basis of 100 in 1913. Taking some twenty dyewares in common use and since 1913 continuously (fifteen British, and five foreign) he found the users were charged from a minimum of 100 per cent. to over 200 per cent. more than in 1913. These items covered dyewares used in both cotton and wool dyeing, and were of various types. Major L. B. Holliday, in his speech to the Society of Dyers and Colourists at their annual dinner, had said: "The consumers had now established themselves in such a position that they were assured of dyestuffs in this country at prices which were never to be higher than the world's lowest prices." He (Sir Henry) was glad that the makers recognised that they had attained to this position, but owing to the cartel, as Continental makers still refused to quote them for dyewares made in this country, it was obvious that they had no means of checking whether they were getting the world's lowest prices or not.

### Dyestuffs Licences

The number of applications received by the Dyestuffs Advisory Licensing Committee during 1935 showed an increase of 7 per cent. as compared with the 1934 figure. Of the 10,092 applications received, no fewer than 9,865 were granted, the remainder being refused and the applicants referred to British sources of supply. Licences were dealt with—as usual—very promptly, the majority being attended to within three days of receipt. The actual quantity licensed in 1935 was lower by some 436,868 lb. than the quantity licensed in the previous year, notwithstanding the increase in the number of applications; and the value went down to £1,500,377, as compared with £1,544,868 in 1934.

The weight of acetate silk dyestuffs imported showed a further increase; but dyestuffs of the vat series suffered a serious fall, dropping from 942 tons in 1934 to 668 tons in 1935. This coincided with the much improved figure for vat colours and indigo produced by the British makers, which increased from 3,603 tons in 1934 to 4,441 tons in 1935. During 1935 the committee received only one application for a licence to import a dyestuff on account of difference in price between the foreign and British products. In this particular instance the licence was granted.

Since the newly appointed Dyestuffs Industry Development Committee commenced its work it had shown great interest in the carrying out of its functions and had visited several works, including those of the British Dyestuffs Corporation, Williams (Hounslow), Ltd., Staveley Coal and Iron Co., Ltd., Lancashire Tar Distillers, and L. B. Holliday and Co., Ltd. The committee had also devoted a good deal of attention to the intermediate question, and at every meeting had reviewed the dyestuffs imported into this country. In this connection, during 1935, a number of products had been put on the market by British makers which displaced imports totalling 160,000 lb. of the corresponding foreign dyestuffs; whilst dyestuffs introduced in 1936 already would have substituted imports totalling approximately 278,000 lb. These products now manufactured in this country would displace a substantial proportion of the foreign dyestuffs which had been regularly imported for some years.

### Key Industry Duties

The Safeguarding of Industries Act was due to expire on August 19, 1936, after having been in operation since October 1, 1921; and at the time of the last annual meeting of the Association the Key Industries Committee appointed by the Board of Trade had commenced its work of considering the position that would arise on the expiry of the Act. The Association having been asked to place its views before the

committee, made representations that the Act should be allowed to lapse as it was felt that it had served its purpose and that, under present conditions, it was not sufficiently elastic in its application; also, that the question of dutiable and non-dutiable articles in the Schedules to the Act could be left in the hands of the Import Duties Advisory Committee. Towards the end of 1935 the committee completed its investigation, and in April of this year a report was issued recommending the continuance of the Act for another ten years. It was his opinion, and that of the council, that there was no need whatever for this Act, as all the various items coming under it could be dealt with in an entirely satisfactory manner by the Import Duties Advisory Committee.

In conclusion, Sir Henry Sutcliffe Smith said when he first addressed the Association as chairman in 1921 he said he felt that his first duty was to safeguard by every means in his power the interests of all colour users—the small user equally with the large user; secondly, that he would do his best to see that the Dyestuffs (Import Regulation) Act was not worked to the detriment of colour users; thirdly, that he would give what assistance he could to help in the establishment of a successful dyemaking industry in this country; and further, that he would endeavour, on their behalf, to maintain harmony in the relations of the Association with the Government Departments concerned, the Dyestuffs Advisory Licensing Committee, the Dyestuffs Industry Development Committee, and with the British dyeware manufacturers.

### Heavy Debt Wiped Out

He had carried out these promises to the best of his ability. When he took over the chairmanship the Association was labouring under the great burden of a debt of £227,000. After Judge Sankey had declared in December, 1919, that all import restrictions were illegal, the council sent a commission to Germany in January, 1920, which purchased approximately one million pounds worth of dyewares. The Dyestuffs (Import Regulation) Act did not come into operation until January 15, 1921, and was preceded by a great slump both in trade and in German currency, with the result that these large purchases of dyewares became enormously depreciated in value. This depreciation left them with a debt of nearly a quarter of a million. Owing to the good offices of Sir Percy Ashley, to whom they owed a deep debt of gratitude—and with the assistance of the Board of Trade and the Treasury, they were eventually able to liquidate their liabilities; and it was with more than an ordinary degree of pleasure that he was able to inform the members at the annual meeting in 1924 that at last they were entirely freed from their heavy obligation.

Numerous problems—many of them without precedent—had been tackled and dealt with during his term of office, and he recognised with deep gratitude that this would often have been a matter of extreme difficulty had he not had the support, the enthusiasm, and the kindly tolerance of the council and the members of the Association. To-day, after 15 years, he began to feel the strain of the chairmanship, and whilst he would always look back with the greatest pleasure on his connection with the Association, he felt he was now entitled to retire and leave to some other member the responsibilities of the position.

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NEW specifications for varnishes, covering production and sales of the product, were established on June 1, 1936, by a decree of the price regulator of the Lithuanian Government. The new specifications state the composition and various tests that must be performed in the manufacture of varnishes. In addition, varnishes must be packed in clean barrels the bottoms of which are painted in red and marked with the name of the manufacturer, the gross weight, the tare and the number of the barrel. Varnishes imported into Lithuania must conform to the new specifications. Merchants were given until July 1 to dispose of their stocks of varnishes which did not come up to the new standard.

## Tightening of Autoclaves and Pipes at High Pressures

By F. G. LAUPICHLER

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THE application of "high pressures" in the production processes of the chemical industries has found a steadily extending field since the successful accomplishment of the ammonia synthesis, whereby the hydrogenation of oils, tar and coal is the process that attracts general interest. The pressures applied to such processes in industrial practice lie in the range of 150 to 1,000 atmospheres, and this range is meant when we refer in this article to "high pressures."

The characteristic feature of high pressure joints is the direct contact of metallic surfaces or edges of those parts that are to be connected in a gas-tight manner, without making use of the common packings such as compressed asbestos. The tightness of such a joint is achieved solely by means of plastic or elastic deformation of these surfaces or edges. The application of this method has brought about the development of special types, and a number of typical high pressure joints for covers of reaction vessels and absorbers, as well as for pipe connections, are here described and their suitability discussed. For all those joints it is of utmost importance that all metallic contact surfaces are most carefully machined and sometimes even polished. Such connections can be taken apart and recomposed very frequently without the remachining of the surfaces or edges of the joint being necessary.

### Autoclave Cover-Joints

For the tightening of covers on the free ends of high pressure vessels there are in use two different methods. The methods secure tightness in a common manner, *i.e.*, the cover bolts have to take up the whole power of the gas pressure and the additional load required to keep the joint tight during operation *before* the pressure is applied to the apparatus; the other method makes use of the power of the gas pressure itself for gradually drawing the connection tight with increasing pressure.

In the first case the material of those parts whose surfaces are pressed together has already to withstand the total strength of the screws before the pressure is brought up, and the gas pressure partly relieves the tension there to such an extent that under working conditions a sufficiently high compression of the tightening elements remains effective. The determination of this additional load is a matter of experience, and depends upon the design and the operating conditions. The other method, however, renders superfluous any additional load at all. An initial slight deformation of the surfaces in contact with one another is sufficient to permit the gas pressure to work, and after its full height is reached the screws have to bear just a load equivalent to the force exerted from the gas pressure upon the cover. In practice it is advantageous from the beginning to put such a load on the screws that no further elongation of them can take place when the pressure is brought up. In this case the cover will not move outwards under the influence of the working pressure. To make use of the pressure itself must be regarded as the typical high pressure method, as it works the better and more reliably the higher the working pressure becomes.

The connection shown in Fig. 1 is not often used as cover joint, but more frequently for the connection of two or more cylindrical parts of large reaction vessels. The design is

quite similar to that of common pipe connections. In general, the area of the flat surfaces that are pressed together is made large enough to render plastic deformation of the material impossible, but if this design is to be used as a cover joint at all it is of advantage to permit a slight permanent deformation. In either case the most careful polishing of the surfaces is essential, and for this reason many efforts have been made to utilize flat annular gaskets of various material in order to render the expensive polishing unnecessary. Experience has proved that the best effect is attained when so-called "deformation-rings" are used, the material of which is either soft enough to compensate the imperfection of the cylinder ends or where the two flat surfaces are provided with concentric grooves so that the sharp edges "flow" under pressure and fill up the scores and scratches of the roughly machined ends.

As material for gaskets to be used at room temperature, hard lead, electrolytic copper and aluminium foils give satisfaction, while for elevated temperatures homogeneous soft iron or alloyed metals for rings shaped like that shown in Fig. 1 (a) have proved satisfactory.

The strain of the bolts in this type of joint is very high. This is due to the fact that it is extremely difficult to make all screws bear equal portions of the load exerted upon them by the cover, and to the fact that at elevated temperatures the relative temperature elongations or contractions of the flanges and bolts influence the joint in a high degree. By measuring in a number of cases the turning moment applied to the screws during the decomposition of the joint the minimum additional load required for securing reliable tightening could be estimated to about 40 per cent. of the power that could be exerted by the gas pressure only to each screw at the assumption that each of them is equally strained, and to about 60 to 70 per cent. at temperatures of 450 to 500°C.

This connection, therefore, offers advantages only when used for small-scale laboratory apparatus, where the bolts are invariably over-dimensioned.

The cover joint shown in Fig. 2 is probably the most frequently used in industrial practice. The conical projection (A) of the cover is driven into the cone of the vessel by means of the screws, or sometimes by hydraulic pressure. Sometimes we find a separate piece, as marked by dotted lines, instead of the cover projection (A). The conical surfaces of the cover and vessel include the same angle with the axis of the vessel, this angle being mostly 22.5° (one quarter of a right-angle). This seems to be of advantage in regard to the accurate and easy execution of the cone, but from the view-point of securing the reliable tightness there could not be found any reason for choosing just this angle, because a great many connections having angles between 15° and 30° have proved just as satisfactory under heavy working conditions. The plain surface of the projection (A) is best suitable for such joints that need not be loosened and re-inserted too often.

If the connection will have to be taken apart fairly often, it is advisable to insert rings with slightly curved surfaces upon the projection cone or into that of the vessel, as shown in (B) and (C). Such rings must touch the cover and the vessel, but in circular lines, before any force is applied to

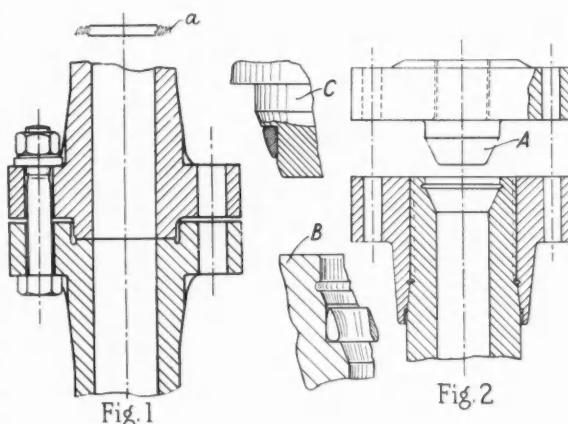
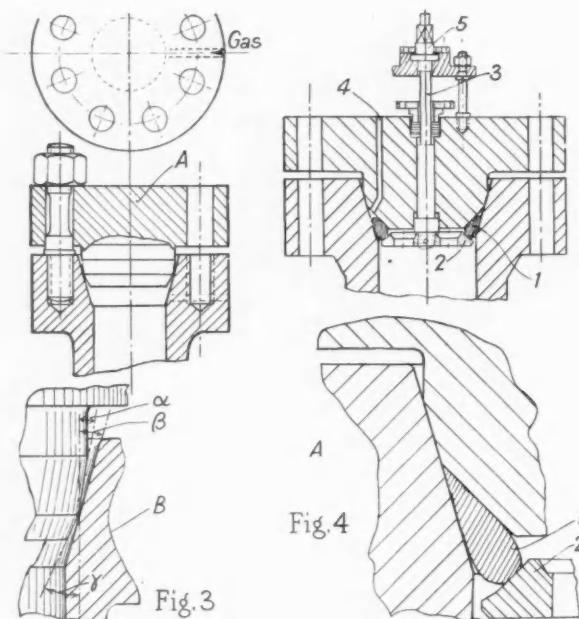


Fig. 2

them, and when the screws are driven home, these contact lines are deformed to conical surfaces. Because of the intended plastic deformation the exact shape of the ring section is not substantial, but it is of some importance after the deformation has taken place that the contact surfaces between ring, cover and vessel are as large as possible, particularly if the apparatus is to be used at high temperatures. For low temperatures electrolytic copper may be used; soft iron or alloyed steels for high temperatures.

The tightness of this connection is achieved by the elastic extension of the end of the vessel, thus producing a shrinking effect upon the cover cone, and it is obvious that this effect can be raised sufficiently high without unduly straining the bolts, because of the wedge effect of the cones, to warrant absolute safety of tightness. This cover joint has proved reliable even under extraordinarily heavy working conditions, and if the surfaces are well polished there is for years no necessity to re-machine them.

An unfortunate combination of the preceding types of connections is that of Fig. 3, which nevertheless is in use on many high pressure plants. Here either a sharp or sometimes a slightly rounded edge of the cover projection is pressed against the cone of the vessel, effecting in this way the



deformation of the edge as well as that of the vessel cone. A deep groove is thus squeezed into the vessel. The size of the three angles  $\alpha$ ,  $\beta$ ,  $\gamma$  is important, for the greater the angle  $\beta$  is, and the more the angles  $\alpha$  and  $\gamma$  differ from  $\beta$ , the more this connection resembles that of Fig. 1; the smaller the difference of the three angles, the more it is like that of Fig. 2. To give, for example, some figures for the size of these angles, we may say that  $\alpha = 7^\circ$ ,  $\beta = 14^\circ$ , and  $\gamma = 21^\circ$  represent the most usual figures. But everywhere where the author found this type of joint, different angles were being used, the size of which was sometimes determined by mysterious rules that apparently had no connection with physical considerations. If the bolts are strong enough, this joint is satisfactory when not exposed to high temperatures. At elevated temperatures it is extremely sensitive. Another disadvantage of this joint is the deep groove that must be squeezed into the vessel, because this makes re-machining frequently necessary if the cover is often removed.

In Fig. 4 is shown one of the designs that are based on the principle to render use of the gas pressure itself. Here the cover had a projection with two cones of different opening angles. The upper one fits exactly in the cone of the vessel

and serves for the accurate adjustment of the cover, while the lower one has a larger opening angle. A metallic ring (1) is pressed into the gap between the cone of the autoclave and that of the cover by means of a circular plate (2), which at the same time keeps the ring in position while being inserted. This plate is provided with large openings, and can be moved towards the cover by turning the nut (5) of the spindle (3). By this procedure the ring with its curved-shaped surfaces is pressed tightly into the gap, thus producing an initial contact. When the pressure is brought up it increases further the total power exerted upon the ring.

### Leaky Joints

The ring has to have a certain resistance against mechanical strain; it can therefore not be made too flexible. For this reason the joint sometimes becomes leaky at the initial stage of bringing up the pressure, the leakage being made visible by the exit of the gas or fluid out of the test bore (4), which can be closed by a valve. Repeated closing and sudden opening of the valve will in most cases suffice to draw the joint tight, and only if this should prove unsuccessful the adjustment spindle (3) may be used. If this joint is once made tight it will never become leaky, even under the influence of sudden changes of pressure and temperature. The manufacture of rings of a large diameter is a very difficult matter, but the reliability of the joint is dependent on the accuracy of its machining.

This cover connection offers the advantage that reliable tightness can be attained with a minimum strain of the bolts, as these have to withstand solely the pressure exerted upon the cover. The joint was elaborated by the author on one occasion when he was asked to adapt a reaction vessel, having an inside diameter of about 1 metre, for use under higher pressures, although the cover bolts were weak enough even for the lower working pressure. Here, in order to avoid any additional strain, the screws, each of which had to take up about 100 tons, were at first driven home by hand and subsequently slightly tightened by a few strokes with a hammer against a short spanner. Although it could be observed that—owing to the stretching of the bolts—the cover moved slightly outwards when the gas pressure was slowly increased to its full height, the joint was tight from the very beginning and remained so during operation. The valve of the test bore (4) remained open all the time. With stronger bolts it would sometimes be commendable to attain a gas-tight contact at the concentration cone as well. This can be useful if the ring becomes leaky as the result of chemical attack.

### Safety Increases with Pressure

This type of connection will work the more safely the higher the working pressure becomes. The stuffing box of the spindle (3), however, will be a source of trouble at temperatures of  $400^\circ$  to  $500^\circ$  C. and pressures above 200 atmospheres. In such cases the spindle can be avoided by the choice of a suitable material for the ring and a suitable shape of its cross section. If properly designed, this joint has even proved satisfactory at pressures as "low" as 130 to 150 atmospheres, and temperatures of about  $470^\circ$  C. Cooling of the packing of the stuffing box was sometimes found to be a valuable means to overcome the difficulties resulting from the influence of high temperatures upon the packing material, but this cannot be done everywhere. In order to give some idea of the total force applied to the ring by the gas pressure, it may be mentioned that about 60,000 kg. are exerted upon the ring used in a joint of an autoclave of an inside diameter of 470 m/m and a pressure of 400 atmospheres.

Whilst the ring of the joint shown in Fig. 4 is drawn tight by that portion of the pressure resting on the ring itself. Fig. 5 represents a cover joint where the total pressure exerted upon the cover is utilised for the deformation of the ring. This power is exceedingly high. For a reaction vessel having an inside diameter of 750 m/m it amounts to roughly 1,600 tons when the working pressure is 300 atmospheres, and

this enormous power is still intensified in its effect upon the ring by the wedge effect of the conical surface of part (A). This type of connection gives full satisfaction at all circumstances. The strain of the cover bolts is here likewise determined solely by the gas pressure. As the ring is strongly deformed, its spoiling can be avoided—if dismantling becomes necessary—only when the bore in the end of the vessel is not made cylindrical but is slightly conical. Copper, some sorts of carbon steel (properly annealed), or chromium-nickel-steel are suitable materials for the ring, the latter being used for preference at temperatures of 500° C.

For the sake of completeness it is necessary to mention another type of cover joint that is with preference used for tightening small autoclaves, namely the so-called "screwless cover joints," by which the cover is inserted in the autoclave by means of a thread turned directly upon the cover itself or by some sort of gun-locks. For large-scale plants these joints do not offer any advantage against the different types discussed here. If they are still used, this originates more from the desire to create something new than from the necessity to really meet a demand of the practice.

(To be continued.)

## Personal Notes

MR. GEORGE HESLOP, of Overhill Road, Dulwich, director of J. C. Eno, Ltd., who died last month at the age of 85, left property worth £45,232.

LORD RUTHERFORD, Cavendish Professor of Experimental Physics and Director of the Cavendish Laboratory, Cambridge University, has been invited to preside at the jubilee session of the Indian Science Congress to be held in India in 1938. It is understood that he is favourably considering the invitation.

DR. S. M. TAO, the granddaughter of a former governor of two Chinese provinces, is China's official delegate to the International Congress for Microbiology, now meeting in London. She is the technical director of the preparation of vaccines and sera at the National Health Administration's laboratories in Peking. Women have taken an important part in the development of modern medicine in China, but Dr. Tao is the first medical woman to be sent as delegate to such an important scientific conference. She intends to spend two months in England making special studies and will continue on a tour of investigation that will take her to many research centres in Europe, Canada, the United States, and Japan before she returns to China in the spring.

MR. R. M. L. ROWE, a former chemist to the Manchester Public Health Department, died at his home at Timperley, Cheshire, on July 27 in his 71st year. He was an authority on atmospheric pollution and for many years kept statistical records of smoke deposits in the Manchester district. He retired from the department about four years ago. His work included investigations on milk, beer, and other subjects, but he was especially interested in the smoke question. Mr. Rowe sat, having been co-opted as a private expert, on the executive of the Manchester Regional Smoke Abatement Committee, the body representative of local authorities which is working out a scheme for regional co-operation in smoke abatement.

SIR HARRY McGOWAN, chairman of Imperial Chemical Industries, Ltd., gave away his younger daughter, Miss Nan McGowan, on the occasion of her marriage at St. Margaret's, Westminster, on July 24, to Mr. Dermot Ralph Daly, Scots Guards, younger son of Major and Mrs. Denis St. George Daly, of Over Norton Park, Chipping Norton, Oxford. Canon Carnegie officiated, assisted by the Rev. C. G. Moon and the Rev. L. N. de Burgh. There were six child bridesmaids—Clare Shennan and Rachel Phipps-Hornby (niece of the bridegroom), Lady Mary Cambridge, the Hon. Anne Harcourt, Phillipa Hunloke, and Belinda Bellville; four page—Peter Stephens (nephew of the bride), Denis Daly (nephew of the bridegroom), Charles Smith-Bingham, and Peter Leach, and six grown-up bridesmaids—Miss Denisse Daly (sister of the bridegroom), Miss Diana Brassey (cousin of the bridegroom), Miss Beatrice Baker, Miss Diana Cooke, Miss Sheelagh Morrison-Bell, and Miss Carmen Cory. Mr. Bowes Daly was best man to his brother. A reception was afterwards held at Claridge's.

MR. ARTHUR WARD, of Inglewood, Lea Avenue, Halifax, an original director of the Bradford Dyers' Association, left £71,398 (net personality £69,671).

SIR ALEXANDER GIBB, a director of the Dunlop Rubber Co., has been appointed to the Council of Foreign Bondholders by the London Chamber of Commerce to fill the vacancy created by the death of the late Sir Felix Schuster.

Lord HIRST of Witton, president of the Federation of British Industries, has been elected chairman of the British Committee on Empire Trade in succession to Sir Alan Anderson, G.B.E., M.P. This committee is representative of the Associated Chambers of Commerce, the Chamber of Shipping, and the Federation of British Industries.

MR. GEORGE SAUNDERS SMITH, a director of Bassett Ore and Metal Co., died on July 22 at the age of 72. Mr. G. S. Smith had been associated all his business career with Messrs. George Smith and Son, of 15 Lime Street, metal merchants, which firm was founded by his father in 1877. He became a partner in 1888. At the same time he was elected a member of the London Metal Exchange, being chairman of committee in 1919 until 1928, when he was appointed to the chairmanship of directors, a position he held until he resigned in March last.

DR. C. A. ANDREWS, an engineer on the production staff of the Anglo-Iranian Oil Co., Ltd., at Fields, has died in Iran. Dr. Andrews had been with the company for only a comparatively short period, as he joined the staff for service in Iran as recently as October, 1934. He received his technical education at University College, London—from which he obtained the Diploma of Civil Engineering—and at Karlsruhe, Germany—where he received the degree of Doctor of Engineering. His experience before he joined the company included service with the British Controlled Oilfields in Venezuela.

BETT FELLOWSHIPS for Scientific Research, tenable at the Imperial College of Science and Technology during the academic year 1936-7, have been awarded as follows:—Extensions of Fellowships already satisfactorily held for one year to Mr. R. Walls, M.Sc., for the continuation of his research on the metamorphic rocks of North-east Scotland, under the direction of Professor P. G. H. Boswell, F.R.S.; and to Mr. E. W. Hewson, M.A., for the continuation of his research in meteorology, more especially the detailed structure of discontinuities between air masses as occurring in England and Canada, under the direction of Professor D. Brunt, M.A. New Fellowships tenable for one year, but renewable for a second, to Mr. E. K. Woodford, B.Sc., M.Sc., of Olds School of Agriculture, Alberta, 1929-30, and the University of Alberta, 1930-6, for research in the physiology of plants, with special reference to problems of plant growth and metabolism, under Professor V. H. Blackman, F.R.S.; Mr. N. Kemmer, D.Ph. (Zürich), of Göttingen University, 1930-1 and 1932-3, and Zürich University, 1931-2 and 1933-5, for mathematics research, using the ideas and formalisms of quantum theory (especially quantum electro-dynamics), under Professor S. Chapman, F.R.S.

## Ammonium Sulphate Sale Dispute

### Case Sent Back to Arbitrator

**A**CASE arising out of credit restrictions in Spain was heard by Mr. Justice Porter in the King's Bench Division on July 24. It concerned a sale of 2,000 tons of American ammonium sulphate at £5 17s. per ton c.i.f. Spanish ports, under a contract dated May 27, 1935, which called for the opening of a confirmed credit in London in favour of the sellers. The confirmed credit was not opened in London until August 26, and then it differed from that called for by the contract. It was not put in order until September 3, seven days after the sellers had repudiated.

The question for the decision of the Court was whether the sellers were justified in their action. It came up on a special case stated by the arbitrator in a dispute between Bernado Garcia, of Astorga, the buyer under the contract, and Chas. Page and Co., Ltd., of London, the sellers.

According to the special case the contract called for shipment during the first half of September, 1935. It contained a term, "Buyer to open immediately a confirmed credit in London in favour of the sellers, etc." The arbitrator found that no credit had been opened for a considerable time, and that Chas. Page and Co., Ltd., wrote several times pressing Garcia to advise them that it had. On August 15 they wrote: "We naturally have made no arrangements yet, because your credit is not through. We think you must realise that we cannot afford to take the slightest risk of shipping the goods and having to take blocked money in Spain."

On or about August 22 Garcia received from Chas. Page and Co.'s agent in Spain a telegram: "Page informs me that if credit is not received in London Saturday they declare null the sale for not complying contract. Making every kind reserves." The Saturday mentioned in the telegram was August 24, and on that day a credit was opened in Spain, though instructions were not received with regard to it in London until August 26th and Chas. Page and Co., Ltd., were only notified on the following day.

#### A Repudiation

It was found that the credit opened differed in two material particulars from that provided by the contract; and on August 27 Chas. Page and Co., Ltd., wrote calling attention to this, and the time that had elapsed since the making of the contract. They added: "It is therefore impossible for us to execute this contract seeing that you have not complied with its most essential conditions." On September 3, seven days afterwards, the confirmed credit was brought into line with the contract, but Chas. Page and Co., Ltd., maintained their repudiation.

Mr. Hodson (for Mr. Garcia) submitted (1) that the term as to the opening of a confirmed credit was not a condition precedent; (2) that if it were it was in substance complied with; and (3) that if it were a condition precedent and was not complied with, it was waived.

Mr. Justice Porter said he was satisfied the provision with regard to the opening of credit was a condition precedent in the sense that sellers would not ship unless it were arranged, but he said the arbitrator had indicated things which pointed to the question of waiver having been brought before him.

Mr. Parry (for Chas. Page and Co.) submitted that there was no dispute that the credit opened and "turned down" did not comply with the contract, and he pointed out that the buyer had allowed part of the shipping period to go by without establishing any credit.

Mr. Justice Porter, in giving judgment, said he intended to send the case back to the arbitrator because there was a question that had not been definitely decided by him. Under the original contract a confirmed credit was to be opened immediately. That meant the buyer must have such time as was needed by a person of reasonable diligence. He could

not himself believe that from May 27 until August 20 would be a reasonable time. But although the establishments of a confirmed credit was a condition precedent it was open to the parties to prolong the time for establishing it. Once there was a prolongation, a reasonable time had to be allowed from the moment when the sellers said: "Now I demand that you shall fulfil that condition." In this case it seemed clear, on present evidence, that until August 22 the sellers were not demanding that the stipulation with regard to the confirmed credit should be immediately fulfilled.

Starting from August 22, the buyer ought to have a reasonable time to establish the credit, having regard to all the circumstances of the case. That might involve the taking of a certain amount of evidence with regard to surrounding facts and circumstances. Personally, he did not think a decision was assisted by the fact that the credit, in its final form, was not established until three days of the time the sellers had for shipment had elapsed. The delay up to August 22 was with their consent, and that might cover the two or three days of shipping time lost. The arbitrator would be asked to find whether the buyer had in this case been given a reasonable time after August 22.

## Explosion at Yorkshire Works

### Four Names on Death Roll

FOUR men have died following an explosion and fire at the chemical works at Knottingley on July 28. The condition of another man, who was burned in the explosion, is said to be very satisfactory. The dead men are:—

Leonard Moseley (49), foreman fitter, of Common Lane End, Knottingley;

George Wentworth Wilcock (34), fitter, of Avenue Mount, Pontefract;

William French (44), of Back Commercial Road, Dewsbury; Arthur Dodson (28), of Selborne Street, Dewsbury Road, Leeds.

The sole survivor of the five victims of the explosion is George Rhodes (30), tar still man, of England Lane, Knottingley.

Moseley, Wilcock and Rhodes were employees of Yorkshire Tar Distillers, Ltd., at whose works the explosion occurred. French and Dodson were employees of the Oxley Engineering Co., of Leeds, which firm does work for the Yorkshire Tar Distillers and associated works. All the four dead men were married. French was an electric welder and joined his firm four years ago. Dodson was his assistant in the workshops and on outside contracts.

The Oxley Engineering Co. has carried out numerous contracts at the works of Yorkshire Tar Distillers. The company have been on the Knottingley firm's book's for about 40 years, and both French and Dodson had visited the works on several occasions to carry out maintenance and repair work.

Officials of the company, together with the Inspector of Factories, are investigating the cause of the explosion. It is officially stated that the pitch boiler, the contents of which burst into flames causing the men to be burned, contains about 30 tons of pitch when full, but that at the time of the accident it was almost empty. Despite the fierce heat, the fire caused comparatively small damage to the plant. The works were reopened on Wednesday and all departments were working at full capacity.

Sir John Simon, the Home Secretary, in a statement in the House of Commons, expressed the deep sympathy of the House with the dead men's relatives. Factory inspectors, he said in his reply to a private notice question by Mr. A. Hills, Labour M.P. for Pontefract, were making inquiries.

## Death of Sir Henry Wellcome

### His Life a Romance of Science and Business

**S**IR HENRY WELLCOME, the well-known scientist, explorer and generous supporter of medical science, died in London on July 25, at the age of 82. Born in Wisconsin, United States, he spent his early childhood in the midst of the Dakota Indian tribes. He attended the schools of the frontier, including one which was held in a typical Western log school house. As a youth he was in the midst of the great Sioux Indian War in Minnesota, when more than a thousand whites were massacred. He was made captain of the boys whose appointed duty was to cast rifle bullets for the defence of the settlement and actively assisted his uncle—a famous surgeon—in treating the wounded.

Having at an early age chosen chemistry and pharmacy as his career, Sir Henry Wellcome studied these and cognate subjects in Chicago and Philadelphia, and shortly after taking his diploma at the latter city went to New York, where his strong bent towards literary activity was shown by various articles contributed to the scientific journals. Sir Henry visited most parts of the North American Continent, and finally South America, where he studied the native cinchona (quinine) forests. On his return from South America he contributed to scientific publications the results of his observations. Attracted by the idea of London as an ideal manufacturing and distributing centre for chemical industries he decided to make England, the land of his ancestors, his future home, and, in conjunction with the late Mr. S. M. Burroughs, established the firm of Burroughs Wellcome and Co., now known all over the world as manufacturers of fine chemicals, alkaloids and pharmaceutical products.

The business, founded in London in 1880, has increased with extraordinary rapidity, and besides the extensive chief works at Dartford, Kent, now has works, offices and warehouses in most of the great centres of commercial activity throughout the world, such as New York, Montreal, Sydney, Cape Town, Milan, Shanghai, Bombay and Buenos Aires. Sir Henry Wellcome became a naturalised British subject in 1910. From the first he was interested in the educational and social betterment of his staff and employees generally. As a part of the general scheme many years ago he founded a club and institute (with park and grounds for field sports and games) in connection with his chief works at Dartford, and considerable sums of money have been expended to provide technical instruction and promote mental and physical recreation.

In 1924 the Wellcome Foundation was formed with Sir Henry Wellcome as governing director to take over the business of Burroughs Wellcome and Co. and the various scientific research institutions and museums founded by the director. In addition to the development of applied science as carried on in the thoroughly equipped experimental laboratories at the Wellcome chemical works at home and abroad, Sir Henry showed his practical interest in general scientific research work by the establishment of a series of research institutions and research museums.

The first of these was the Wellcome physiological research laboratories, originally established in London in 1894 and moved subsequently to Brockwell Hall, Herne Hill, and finally to Langley Court, Beckenham, Kent. Then followed the Wellcome chemical research laboratories established in London in 1896.

In 1913 Sir Henry Wellcome founded in London the bureau of scientific research to co-ordinate the work of his separate research institutions as well as to undertake original investigations in tropical medicine, hygiene, sanitation and parasitology. This bureau places its records, equipment and experience gratuitously at the disposal of medical men, sanitary administrators and others interested in tropical medicine and hygiene, and, to further the convenience of research workers, inquirers and visitors, there is associated with it the museum of medical science, illustrating the subjects in a graphic and readily accessible manner. Another research institution associated with the bureau is the entomological field laboratories originally located at the Royal Horticultural Society's gardens at Wisley, Surrey, and now transferred to more commodious premises at Claremont, Esher, Surrey.

The year 1931 saw the foundation of the Wellcome Research Institution, designed to embrace the various research laboratories and museums, etc., founded by Sir Henry, to provide for their extensive developments and to co-ordinate and extend their activities.

The cause of geographical science and the exploration and opening up of unknown lands found in Sir Henry a generous supporter and he was foremost in rendering practical assistance. Many of the great exploring expeditions of modern times have been medically equipped and financially assisted by him. In connection with the South African war he bore the entire cost of the medical and surgical equipment of the hospital ship "Maine." Among many evidences of his manifold activities during the great war may be mentioned the presentation to the British Army of a completely equipped motor bacteriological laboratory for use in

Egypt and Palestine, and the placing of the resources of his research laboratories at the disposal of the Government.

This year the President of the French Republic conferred upon Sir Henry the Cross of the Officier of the Legion of Honour. In recognition of his outstanding services to Spanish interests there was also conferred upon him the decoration of the "Comendador de la Orden de la República." He was created a knight in recognition of his manifold and munificent services to research in medicine and its allied sciences. Sir Henry Wellcome had numerous honours conferred upon him including the degrees of LL.D., D.Sc., and Hon. F.R.C.S. Eng. In May, 1932, the Royal Society unanimously elected Sir Henry a Fellow.

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THE demand for essential oils and related products in Ecuador during the past few years has constantly increased due to the development of the increased manufacture of soap and pharmaceuticals. However, the demand is still relatively small owing to living standards and general purchasing power which are considerably below the level prevailing in the United States and Europe. Germany is by far the leading supplier. It is reported that the demand is supplied by well-known German, Netherlands, American, French and British firms. Competition is very keen. Manufacturers' agents do not carry stocks of oils, nor is it known that any wholesalers carry these lines. Orders are placed through agents, and it is supposed that when an emergency arises, a consumer buys provisional supplies from a competitor.



Sir Henry Wellcome, F.R.S.

## The Chemical Age Lawn Tennis Tournament

### Arrangements for the Finals

**B**Y the kind invitation of Sir David Milne-Watson, governor of the Gas Light and Coke Company, the final matches in the sixth annual CHEMICAL AGE Lawn Tennis Tournament will be played at the East Ham sports ground of the Gas Light and Coke Company on the afternoon of Saturday, September 12. The ground is situated close to the East Ham Underground Railway station, and it is also of some interest to note that it is within a short tram ride of the company's chemical works at Beckton.

Mr. E. Glanvill Benn, a director of Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, will present the cups and statuettes at the close of the matches, and a large attendance is expected. The matches will be played on a hard court, and according to the law of averages there is reasonable ground for hoping for a fine day.

The tournament this year attracted an increased number of entries, and some keen play has been witnessed in the early rounds. The unsettled weather has necessitated an abnormal number of postponements of fixtures, and those who have still to play matches are asked to speed up their fixtures as much as possible to avoid delays in the semi-final stages on account of holidays or other circumstances.

Both the singles and doubles are likely to produce some interesting play in the finals. The holder of THE CHEMICAL AGE cup for the singles, J. Haines (Anglo-Iranian Oil Co.), gave his opponent a walk-over in the first round. He and his partner, F. G. Hawley, of the same company, also hold THE CHEMICAL AGE doubles cup, which they have won for the past three years in succession. They did not, however, enter the doubles this year, but, as reported last September, they have

kindly agreed to hand back the cup to be competed for in perpetuity. Of the twelve players still left in the singles, two have won the cup in previous years. There are still six pairs in the doubles, including two pairs who have played in previous finals, but no former cup holders.

THE CHEMICAL AGE cups will be presented to the winners, and we are pleased to announce that statuettes for the winners will again be presented by Thomas Hill Jones, Ltd., and statuettes for the runners-up by Mr. W. Lloyd Willey.

#### Third Round Results

##### SINGLES.

G. A. Hanson (Whiffen and Sons, Ltd.) beat H. G. Waters (Anglo-Iranian Oil Co., Ltd.), 7-5, 6-3.

L. F. Grape (Borax Consolidated, Ltd.) beat A. E. Hughes (Limmer and Trinidad Lake Asphalt Co., Ltd.), 6-4, 7-5.

A. Baxter (United Yeast Co., Ltd.) beat V. D. Thompson (Stafford Allen and Sons, Ltd.), 6-3, 6-3.

C. C. Gough (Lever Bros., Ltd.) beat E. Pavitt (Co-operative Wholesale Society), 6-2, 6-2.

R. M. O. Williams (Chance and Hunt, Ltd.) beat W. Hoppe (Johnson Matthey and Co., Ltd.), 6-4, 6-1.

##### DOUBLES.

A. E. C. Willshere and L. F. Grape (Borax Consolidated, Ltd.) beat P. D. O'Brien and F. D. Hand (B. Laporte, Ltd.), 6-0, 6-1.

C. C. Gough and T. P. Williams (Lever Bros., Ltd.) beat J. H. Bennett and J. E. H. Hayward (Bakelite, Ltd.), 6-1, 6-2.

## Estimating the Manganese Content in Stainless Steel

By L. RUSSELL and J. JOHNSTON

**T**O those engaged in the analysis of stainless steel the chlorate method for the estimation of manganese presents some difficulties which we find can be overcome. Viewing time as the greatest factor in any accurate analysis, we have devised a method which can be completed in 45 minutes as compared with the four hours taken by the chlorate method. The second factor in most laboratories being expenditure this method justifies itself by cutting costs to the barest minimum, in fact, by quartering the quantity of chemicals used in the chlorate method.

Manganese is usually estimated in ordinary steel by oxidation with ammonium persulphate in presence of silver nitrate, the resultant solution being titrated cold with a standard solution of sodium arsenite. But since ammonium persulphate not only oxidises manganese but also chromium, the latter method cannot be used directly in stainless steels. The reason for this is that a definite end point cannot be obtained owing to the orange coloration of the chromate interfering with the titration. Here in the following method we have rid ourselves of this hindrance by separating the manganese from the chromium and the iron, so leaving the manganese in solution.

Reagents required :

Silver nitrate solution	..	1.5 gms. silver nitrate in 1,000 c.c. water.
Sulphuric acid	..	Sp. Gr. 1.3
Nitric acid	..	Sp. Gr. 1.2
Sodium arsenite Solution	..	0.65 gms. Sodium arsenite in 700 c.c. water and 300 c.c. saturated sodium chloride solution.

Place 0.1 gm. of sample in beaker, and 0.1 gm. of a stan-

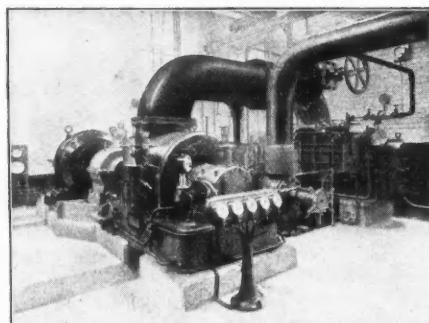
dard steel containing about an equal quantity of manganese as sample in another beaker. Dissolve in 10 c.c.  $H_2SO_4$ , nearly neutralise with NaOH, making sure that no permanent precipitate remains. After adding approximately 2 gm. zinc oxide, bring to boil, filter; collecting the filtrate, free from iron and chromium, in a flask suitable for titration. Add to each 5 c.c.  $HNO_3$ , boil, add 20 c.c.  $AgNO_3$  and 2 gms. ammonium persulphate. Reboil for few minutes, cool and titrate with sodium arsenite until pink colour completely disappears.

The strength of the sodium arsenite being determined by the volume required to reduce the standard, the percentage manganese in the sample can be calculated as follows :—

$$\begin{array}{lcl} \text{Sodium arsenite required by sample} & = & 10.1 \text{ c.c.} \\ \text{Sodium arsenite required by standard} & = & 8.4 \text{ c.c.} \\ \text{Percentage of manganese in standard used} & = & 0.914\% \\ \therefore 8.4 \text{ cc. Sodium arsenite} & = & 0.914\% \text{ Mn.} \\ & & 0.914 \times 10.1 \\ \therefore 10.1 \text{ cc. Sodium arsenite} & = & \frac{8.4}{0.914} \\ & & = 8.4 \\ \therefore \text{Percentage of manganese in sample} & = & 1.10\% \end{array}$$

While the addition of nitric acid is necessary to prevent precipitation of hydrated manganese dioxide, it is also necessary to add the same amount of nitric acid to the standard as to the sample. The volume of sodium arsenite solution required by the sample or standard varies accordingly with the volume of nitric acid added, so it is very important that each receive the same quantity of acid.

This method was found to give very consistent results which compared favourably with the chlorate method.



500 K.W. Pass-out Turbo-Generator.

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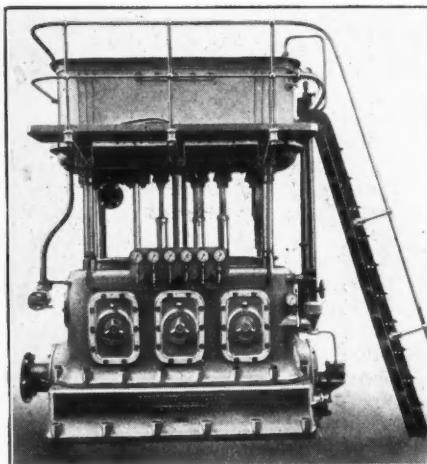
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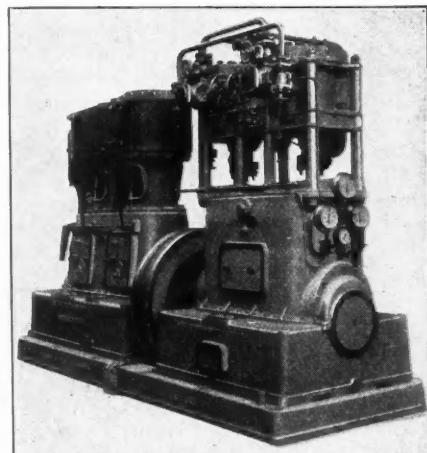
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## Technique of the Hydrogenation of Coal

### Discussion on Dr. J. G. King's Institute of Fuel Paper

**L**AST week we published a summary of the paper which Dr. J. G. King, of the Fuel Research Station, presented at the annual meeting of the Institute of Fuel on the subject of "The Technique of Hydrogenation of Coal and Its Products." Below is a report of the discussion which followed the reading of the paper.

Dr. G. W. ANDERSON said he had always had the highest admiration for the work carried out at the Fuel Research Station and he had been more impressed than ever by the information given by Dr. King in the present paper. It was the best paper he had heard read so far on the subject, because no previous paper by any other author had given so lucid an exposition of the various factors involved. It was most illuminating to note that even high-temperature tars were considered nowadays as coming within the possibility of hydrogenation; until quite recently that had always been denied.

#### The Fischer Process

One wondered, said Dr. Anderson, why high pressure hydrogenation should be the only process of hydrogenation considered in this country. By way of comparison he mentioned the Fischer process, which hydrogenated carbon monoxide to any types of light or heavy oils, and at low pressure. It was argued by the advocates of high pressure hydrogenation that the difficulties presented from an engineering point of view had been largely overcome and that there was hardly any difficulty involved in constructing the necessary plant. That was true, as shown by the excellent example at Billingham, but he did not think the advocates of high pressure hydrogenation could deny that such plant was costly and that the process must be costly by virtue of the fact that comparison costs were by no means small. If Dr. King would state what were the advantages of high pressure hydrogenation as compared with hydrogenation by the Fischer process, many people in the industry would be greatly indebted to him.

Dr. N. BOOTH (Fuel Research Station) pointed out that in the hydrogenation of coal the vehicle was used originally, of course, in order to paste the coal and present it to the plant in a suitable form. Nowadays, however, the vehicle is recognised generally as having a specific effect. There seemed to be four ways in which the vehicle could influence the hydrogenation of the coal. In the first place, it could act purely as a dispersion medium, peptising the coal and breaking it down to particles possibly of colloidal dimensions. Secondly, it could act as a carrier for hydrogen, transferring it from the gaseous medium to the coal and presenting it in suitable form by the formation of hydrogenated compounds which were de-hydrogenated in turn by the coal. Thirdly, the vehicle could help to disperse any local exothermic heat of reaction and so prevent coking reactions setting in. Fourthly, it could act by removing oils formed on the surface of the coal, so exposing fresh surfaces to the action of hydrogen.

#### The Most Suitable Oils

Work had been carried out at the Fuel Research Station with a variety of vehicles, including phenol meta-cresol, beta-naphthylamine, and so on, and also with oils derived from coal by high or low temperature carbonisation or by hydrogenation. The main conclusion seemed to be that the oil must be present in the liquid state at reaction temperature. Phenolic bodies were particularly useful. The heavier oils in general were more beneficial than lighter oils, and oils produced from coal by hydrogenation were more suitable than those produced by low-temperature carbonisation. One of the most suitable oils was one boiling at about 360°, formed by the hydrogenation of coal; that was particularly

fortunate, as it was almost essential to use such an oil, at any rate in part, as the vehicle on the large scale.

In attempting to hydrogenate a coal of high carbon content, such as 86 per cent. for example, it was found that as the temperature was increased the results became better; but one could not go very far in that direction, owing to the fact that coking reactions set in. An increase of pressure acted as the equivalent of an increase of temperature, but prevented the coking reactions setting in. So that the more difficult a coal was to hydrogenate, the higher were the pressures needed to effect the hydrogenation. As Dr. King had indicated, perhaps at a not too distant date pressures higher than 200—250 atm. would be used.

#### Reducing Fusain Content

Commenting on the point made by Dr. King, that the carbon content of a coal was a suitable criterion whereby to decide upon the coal to be used, Dr. Booth pointed out that fusain had been found to be incapable of any appreciable hydrogenation under the conditions normally used for coal. Therefore, one must either choose a coal with low fusain content or find a method of reducing the fusain content—as by de-dusting, for example. Further, for mechanical reasons the ash content of the coal must be limited, and in this connection he mentioned particularly the wear and tear of the valves, due to the ash content. The higher ash-content coals, of course, could be used, but they must be washed first in order to reduce the ash content to something like 3 per cent. or less.

Dr. G. E. FOXWELL said that when phenol was hydrogenated at high temperature and high pressure it would break down into benzene, and when it was treated by ordinary carbonising practice under ordinary pressure and at very much higher temperature it would also break down into benzene. Therefore, it seemed that with certain substances it was necessary only to apply a still higher temperature in order to secure more easily at a lower pressure the products that were required. But inasmuch as that would result in the production of more coke, the point arose as to whether we should not fractionate oils more carefully and treat some of them at higher temperatures and lower pressure.

#### An Entirely New Field

Emphasising the remarks made by Dr. Anderson concerning the Fischer process, Dr. Foxwell said that he did not know the economics of that process as compared with hydrogenation, but he believed that the Germans were installing a greater capacity of Fischer plants than of hydrogenation plants. So far there were more of the hydrogenation plants because the hydrogenation process had started first; but he believed that the first really big Fischer plant was put into operation in Germany this year, and that two or three more would follow fairly soon. The two processes were not necessarily competitive. The hydrogenation process dealt with oils and with coals of moderate and lowish carbon content. The Fischer process dealt with coke and with materials which it was very difficult to treat by ordinary processes of hydrogenation. He suggested that, now that the Fuel Research Board had done its bit with regard to hydrogenation and could leave it to Imperial Chemical Industries, the Board might very well turn its attention to the newer process, which in this country was in an entirely new field.

Dr. ELVET LEWIS asked what attempts had been made to recover the molecular hydrogen from the hydrocarbon gases given off in the reaction, and what influence such recovery of hydrogen would have on the total amount required for the reaction.

Dr. BURNS pointed out that in the Fuel Research Station plant the raw material was preheated in a pipe still, and asked whether Dr. King had experienced any difficulties in preheating the material by that method; he asked particularly whether there was an increase in the asphaltic content of the raw material on passing it through the pipe still, because he believed that that was one of the difficulties associated with low-temperature tar. Another question was whether any provision was made for the removal of sulphuretted hydrogen from the circulating gas. Many low-temperature tars and creosote contained from 1 to 2 per cent of sulphur, so that there was a corresponding amount of sulphuretted hydrogen in the circulating gas, and that sulphuretted hydrogen would accumulate if no provision was made for its removal. With regard to the difficulty experienced owing to the ammonium salts blocking the tubes, Dr. Burns asked whether the carbon dioxide was removed from the hydrogen before it went into the reaction vessel.

#### Elimination of Ash

Mr. P. C. POPE (Secretary of the Institute) asked if Dr. King had any information with regard to the Stinnes process for the complete solution of coal substances in creosol and tetralin, and whether he could give a personal opinion as to whether the use of tetralin and creosol under those conditions was worth while economically, removing the ash entirely by filtration of that liquid product of coal, and using that product subsequently for normal hydrogenation. The ash content gave rise to one of the big troubles mechanically in hydrogenation plant and he wondered whether if the ash were totally eliminated, as he understood it could be eliminated by the Stinnes process, that process could be made to pay.

Dr. C. M. CAWLEY (Fuel Research Station) said that all difficulties relating to the engineering and operating side of the plant at the Fuel Research Station had been overcome. There had been a little difficulty with the deposition of material in the preheater, but no trouble had been experienced by way of asphalt formation. The investigators had not yet been able to detect any change in the raw material as it passed through the preheater, but they might expect a slight decrease rather than an increase of asphalt formation, because experience suggested that a small amount of hydrogenation occurred. The ammonium salts were mostly ammonium chloride and not ammonium carbonate; so that although there was a certain amount of carbon monoxide in the hydrogen, it was not removed, and it would be wasteful to do so, because the carbon monoxide was hydrogenated to methane and water. The difficulties due to ammonium salt concentrations had been overcome by flushing water. The hydrogen sulphide was removed from the gases automatically in the gas scrubber, which was employed primarily for removing the gaseous hydrocarbons which were also formed as by-products in the process. The hydrogen sulphide was relatively much more soluble in the oil, and it was taken out firstly in the liquid products in the high-pressure separator and again by the scrubbing oil in the gas scrubber.

#### Working Life of Catalyst

It was apparent, said Dr. Cawley, that success or failure of the plant now depended upon how the catalyst aided initial activity and the working life of the catalyst. Unfortunately the activity did fall off to some extent, and that was found to be due to three causes, *viz.*, a physical change in the catalyst, a chemical change and a change due to the raw material. The physical change had been stated by Professor Rideal and Dr. Kingman recently in "*Nature*" to be due to the effect of heat on the molybdenum-sulphide catalyst; there was an increase of particle size on heating and a consequent loss of surface area and catalytic activity. With regard to the chemical change it was known that the active catalyst was a molybdenum-disulphide ( $\text{MoS}_2$ ), and in order to maintain it in that form it was necessary that the concentration of hydrogen sulphide in the reaction gases should be of the order of one atmosphere partial pressure. There was about one

per cent of sulphur in the tars and tar oils normally treated, and, fortunately, that provided just about sufficient hydrogen sulphide to maintain the  $\text{MoS}_2$  in the active form.

An important matter in the treatment of low-temperature tars, continued Dr. Cawley, was the deterioration caused by the coking effect referred to. They had undertaken, perhaps, a rather sticky job in attempting to treat the whole tar in one stage in one set of conditions. The tar consisted of a wide range of pitchy substances, boiling at temperatures up to about  $400^\circ$ , and in attempting to produce spirit in one stage those substances were treated at a rather high temperature. It followed that a number of those substances, far from being hydrogenated, might be dehydrogenated and polymerised, forming compounds which were deposited on the catalyst and which cloaked it, thus reducing its activity. Although that deterioration could be reduced by using high pressure it had been entirely overcome. They had chosen a molybdenum catalyst carried on an inorganic support so that it could be readily reactivated by oxidation in air. A more active catalyst could be obtained by pelleting pure molybdenum sulphide, but reactivation involved complete regeneration and re-preparation which was a costly process.

#### A Two-Phase Process

The process could be developed on the lines of changing it to a two-phase process, in which a tar was first treated to give a product which would not contain the high-boiling substances, the second stage being concerned with the treating of the refined fraction, thus reducing the deterioration practically to zero. It was entirely a matter of economics as to whether the process should be worked with a single stage or should be split up into two stages in order to be able to use a more active catalyst, and to increase very largely the life of the catalyst. In the process as it was being worked at the Fuel Research Station, the life of the catalyst was from four to six weeks; if the material were first refined before treatment the catalyst would give a life of six months or more.

Mr. JOHN ROBERTS, commenting on the reference to the fact that by hydrogenation a non-caking coal could be made to coke, said that Dr. King had mentioned only a high-volatile coal in that connection, having a volatile content of 46 per cent. That coal had not reached the mature stage of a coking coal in nature, but by hydrogenation it was maturing and brought to the coking stage. At the other extreme, however, the reverse process was applied; an anthracite, which had really passed beyond the coking stage, was de-maturred by hydrogenation and thus brought back to the coking stage where it would coke very slightly. Suggesting an explanation, Mr. Roberts said it appeared that in the former case the hydrogen combined with certain other elements to form a tar or a tarry material, or a gamma compound (whatever that might be), which brought about fusion and formed a coke.

#### Treatment of Anthracite

But in the case of an anthracite the conditions were rather different; there was practically no tar in it, although there was a little. If one roasted a chunk of anthracite before a gas fire until the hottest part of it was beginning to burn, one could observe a gradation from the hot part to the cool part of the anthracite; by means of a magnifying glass one could trace all the stages through which anthracite passed under heat treatment. At the outer edge, which was the coolest part, one noted the first change, a constitutional change in the anthracite. It developed a beautifully uniform wavy structure. The comparable stage in a coking coal, however, was not a wavy structure.

The first change that occurred on heating a coking coal was not even the fusion; it was the pre-fusion stage, showing a finger-print structure. Then came the fusion zone. In anthracite, however, there was not a fusion zone. Next to the pre-fusion wavy zone there was a zone in which microscopic pores were developed. Following that stage there was the charcoal stage (the hottest portion) and the combustible properties of anthracite were due to the fact that in the early

stages of heating it was converted into charcoal; otherwise it would be difficult to burn. One would also find traces of tar around the edges of the specimen. It appeared that in hydrogenation there was a combination of hydrogen with carbon to form a hydrocarbon or it was combining with the hydrocarbon remaining there to give a tarry substance, there being just sufficient to produce a proper coke structure rather than the porous charcoaly structure.

Dr. KING, dealing with Dr. Anderson's reference to a denial that high-temperature tars could be treated by hydrogenation, said that it was not so much that that had been denied, but it had been stated that high-temperature tars had not yet come into the picture. Experimental work was being started on such tars, however, and there was every hope that they would yield to treatment.

#### A Question of Economics

The question as to why the Fischer process was not used instead of the Bergius process was largely one of economics. An important factor was that the Fischer process had a thermal efficiency of about 25 per cent., which thermal efficiency could not be increased unless greater use could be made of the heat of reaction; the thermal efficiency could not be increased above 25 per cent., unless the process were associated with another system which could use the heat and perhaps credit the process with that heat. The I.C.I. hydrogenation process, however, was claimed to have a thermal efficiency of more than 40 per cent., so that the difference between the thermal efficiencies of the two processes was really considerable. But he understood that the thermal efficiency of the process as at present operated at Billingham was not much more than 30 per cent., the reason being concerned with the recovery of hydrogen from the hydrocarbons formed in the reactions. The hydrocarbons could be catalysed in the presence of steam to form hydrogen. That process was in everyday use by the I.G. in Germany and was also part of the Standard Oil Company's practice in the hydrogenation of petroleum oils at New Jersey. There they treated natural gas, which was mainly methane, and cracked the methane in two stages to hydrogen in the presence of two different catalysts, the hydrogen being used for the hydrogenation process.

If the hydrocarbons liberated by oil scrubbing in the Fuel Research Station plant were treated in that way they would produce sufficient hydrogen for the process if, when using tar, 8 per cent. of the carbon of the tar were converted into hydrocarbons; when using coal, if about 15 per cent. of the carbon of the coal were converted into hydrocarbons one could form sufficient hydrogen to carry on the process, no additional hydrogen being required except, perhaps, for purging the plant free from nitrogen at intervals. Those proportions of carbon converted to hydrocarbons were not abnormal, so that no radical change of the process would be necessary in order to operate under those conditions. It was true that Fischer plants were being installed in Germany and that a fairly large-scale Fischer plant had been started or was about to start there. Whether it would ever be adopted in this country or would compete with the process for the hydrogenation of coal was a matter which would be decided only by consideration of £'s d., which had reference, of course, to thermal efficiency.

#### Formation of Benzene

With regard to the point that benzene was formed in the carbonisation of coal, presumably at the expense of phenol, he said it was questionable whether the reaction proceeded in that direction, and whether phenol was formed first and benzene later, because phenol was relatively stable at fairly high temperatures. It was most unlikely that the simple cracking of phenols or phenolic bodies would ever be applied as a source of aromatic hydrocarbons.

Replying to Mr. Pope, he said he did not know much about the success of the process for the solution of coal in tetralin. Coal could be dissolved to the extent of something like 85 per cent. in tetralin, and the solution contained a very much

smaller proportion of the ash of the coal than it was possible to obtain by any other technical process. It was quite likely that coal-using processes might arise in which it would be absolutely essential to use coal which was entirely free from coal ash, and that the evidently expensive solution process would pay for itself in connection with such coal-using processes. He was not sure, however, that he was right in using the term "entirely free" from coal ash, because the ash of coal was not entirely removed by solvent extraction; it was possible for iron in the coal ash to pass into the solution, though he did not know in what form. No doubt the process would be extremely valuable where it was possible to pay a fairly high price for very pure coal, and no doubt the Stinnes Company had worked on the process from that point of view.

#### First Action of Heat

Commenting on Mr. Roberts's reference to the variation of the structure of anthracite during heating and during the different stages of heating from bituminous coal, Dr. King said it was his experience that certain low-grade non-caking coals behaved in the same way. It had been pointed out as long ago as 1825, or thereabouts, that the first action of heat on coal was to destroy the spore exines and plant remains and to leave small holes in the places where those spore exines and plant remains had existed, thus introducing into coals that had been rich in plant remains a micro-pore structure which those coals did not possess previously.

Asking if Mr. Roberts suggested that that might happen in the case of anthracite, Mr. Roberts said that he did.

Dr. KING, dealing with Mr. Roberts's reference to the mechanism of the combination of hydrogen with non-coking coal being quite different from that of the combination of hydrogen with anthracite, said that the overall effect of combination of hydrogen with coal was measured as combination with oxygen; all one could say was that the hydrogen combined with the oxygen and eliminated the latter as water in the case of bituminous coal, forming a material which would not necessarily have a higher carbon/hydrogen ratio, but which had coking properties. In other coals, not necessarily anthracite, but semi-bituminous coals, the effect was not merely the elimination of water, but partly the elimination of water and partly the addition of hydrogen in the chemical sense; i.e., the carbon/hydrogen ratio was definitely increased. That rather upset Mr. Roberts's theory, however, because it seemed that the combination of hydrogen with coal occurred in some bituminous coals, but not in other coals.

### Chemical Fertilisers in Belgium

#### Rapid Fall in Production

FERTILISER manufacture constitutes one of the most important branches of the Belgian chemical industry. The larger needs of Belgian agriculture are amply supplied, and a surplus of ammonium sulphate, superphosphates, potassium sulphate, and basic slag is exported. Beside the important export products, Belgian chemical fertiliser works produce sulphonate of ammonium, cyanamide, calcium nitrate and other compositions. The local deposits of natural phosphate in the basins of Mons and Liège are low in phosphoric acids, and supplies of phosphate rock have to be imported. No known deposit of potassium salts exists in Belgium. Belgium now possesses 15 modern factories for the production of superphosphates, with a total capacity of 500,000 metric tons. During average years, these factories consume about 200,000 metric tons of sulphuric acid and about 225,000 tons of phosphates. Since 1930 production has fallen off rapidly, owing to the competition of factories in other European countries, and to the agricultural crisis. France and England have ceased buying the major part of the Belgian exports, and with this important decrease in markets, production lags. The important Belgian zinc and copper smelters using sulphide ores are working under a disadvantage so long as the superphosphate industry fails to absorb their yield of by-product sulphuric acid.

## From Week to Week

SANGERS, LTD., of 258 EUSTON ROAD, N.W.1, have increased their nominal capital by the addition of £100,000 beyond the registered capital of £1,150,000.

THE SHAREHOLDERS OF METAL INDUSTRIES, LTD., are to receive a bonus in shares of £1,120,000 as a result of a decision at a meeting of the company in Glasgow on Monday. The capital is to be increased from £1,380,000 to £2,750,000 by the creation of new shares.

A CORRECTION SHOULD BE MADE in one of the book reviews published in *THE CHEMICAL AGE*, July 25, 1936, page 81. "Modern Kolloidwissenschaft" should read "Kolloidik: Eine Einführung in die Probleme der Modernen Kolloidwissenschaft." By Dr. A. von Buzágh.

THE RE-OPENING OF THE explosives factory at Linlithgow is being reconsidered by Nobels, Ltd. The inhabitants will welcome the re-opening of this factory which was the principal industry in the town since 1903. It was closed down owing to the transfer of manufacturing operations to Stevenson, Ayrshire.

THE PAPER ON "The Pathological Effects of Poisons Used for Rodents" which Mr. J. G. Wright, lecturer in surgery and materia medica at the Royal Veterinary College, read at a meeting of the University of London Animal Welfare Society in the spring at the college of the Pharmaceutical Society has been reprinted in pamphlet form. Copies may be obtained from the Society's office at 42 Torrington Square, London, W.C.1. The paper makes an important contribution to the study of poisons used for rodents.

FOLLOWING UPON THE RECENT ACQUISITION of the ordinary share capital of the Lanarkshire Steel Co., by Colvilles, Ltd., the board of the former concern has been reconstituted as follows: Mr. John Craig, chairman; Mr. James M. Strain, Mr. Henry Lithgow, Dr. Andrew McCance, Mr. Harry Cunningham, and Mr. T. R. Craig. Mr. John Craig is chairman and managing director of Colvilles, Ltd. Mr. James M. Strain, who has accepted Colvilles' invitation to continue on the Lanarkshire board, has for many years been chairman of the Lanarkshire Steel Co., with which his family has been closely associated since its formation.

OVER 1,300 MEMBERS OF THE AMALGAMATED ENGINEERS' UNION at Imperial Chemical Industries, Ltd., Billingham-on-Tees, are demanding a wage increase of £1 a week and are threatening strike action unless their demands are agreed to. Some months ago the men applied for an increase of four shillings weekly which would bring their wages to £3 10s. 5d. a week, being 10s. 5d. above the basic rate. Negotiations were delayed and the demand has now been raised to £1 weekly, bringing the wage up to £4 6s. 5d. It is understood the ballot on strike action will take place at the end of this month, but in the meantime I.C.I. hope to arrange a meeting with the men. The company has recently granted a wage advance of 3s. weekly to be paid in three instalments to adult workers.

THE TREASURY HAS ISSUED, on the recommendation of the Import Duties Advisory Committee, the Additional Import Duties (No. 19) Order, 1936 (S.R. & O. 1936, No. 736), which increases the duty on dried chamomile flowers, whether ground or not, from 10 per cent. *ad valorem*, to 3d. per lb. The Order takes effect from July 28. In its report the committee says that chamomiles, which are used in the production of toilet and medicinal preparations, have been cultivated in this country for some time past for the distillation of oil from the fresh flowers. More recently cultivation to supply the market in dried flowers has begun, a development which has provided useful employment for agricultural workers between the seasons of pea and soft fruit picking and sugar beet hoeing. Severe price cutting has, however, taken place in imported flowers, and the purpose of the increased duty is to diminish competition of this kind. The increase in the duty is not likely to affect the consuming industries adversely.

THE APPEAL BY BRITISH CELANESE, LTD., against the dismissal by Mr. Justice Clauson in the Chancery Division of its action against the British Acetate Silk Corporation, Ltd., alleging infringement of patents for spinning artificial silk, was dismissed in the Court of Appeal on July 23. The Master of the Rolls, in giving judgment dismissing the appeal, said that the object of the plaintiffs' device was to cause the evaporative medium to pass in the immediate neighbourhood of the jet which emitted the filaments, so as to get rid of the acetone. There was no novelty in the idea, and if there was novelty at all it must be in providing some collector device to achieve the object. It was on that point that the objections of prior user and anticipation had been raised to the plaintiff's patent. The objection of prior user was based on a simple piece of mechanism called a baffle plate which Courtaulds put in operation in 1926. With regard to anticipation, there was the Bouffé device of a narrow cylinder. The object of the Bouffé device was not to get rid of the acetone as quickly as possible, but it was clear that the apparatus had that very effect.

THE NOMINAL CAPITAL OF Ford Soap and Chemical Co., Ltd., 5 Bazaar Street, Pendleton, Salford, has been increased by the addition of £1,700 beyond the registered capital of £300.

THE WORD "LIGNIN" was erroneously substituted for "lignum" in Mr. W. S. Dahl's letter in *THE CHEMICAL AGE* last week, in which, in discussing the bleaching of wood flour, he mentioned that all the lignum must be taken out of the wood before the application of either chloride or calcium or sodium bisulphite.

THE BRITISH COLOUR COUNCIL has issued a colour card showing two new National colours—"Coronation Red" and "Coronation Blue." Coronation Red is a red which rightly comes under the heading of crimson. Coronation Blue is slightly more red than the actual colours of lapis lazuli from which ultramarine was derived.

FOLLOWING ON THE ANNOUNCEMENT that wage increases and holidays with pay had been granted to the employees of the British Aluminium Co., Ltd., in six of the firm's works in Scotland, England and Ireland, the men on strike at the Inverlochy works held a meeting on Saturday last to consider future action, and agreed to renew their pledges to stand loyally by the Scottish Transport and General Workers' Union.

THE WORLD'S FIRST PLANT for making Diesel oil from coal has been opened at Gawber, near Barugh, Yorks. The new plant, erected by Low Temperature Carbonisation, Ltd., at a cost of £25,000, specialises in the high grade oil required for road transport vehicles. The oil is also suitable for rail Diesels which have been used abroad for some years and which are now being tried out in this country.

THE IMPORT DUTIES ADVISORY COMMITTEE has received an application for the addition to the free list of diatomaceous earth, other than raw diatomaceous earth as quarried which is already free of duty. Representations should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than August 27. The committee has decided not to make any recommendation in respect of an application for an increase in the import duty on certain powdered graphite, plumbago and blacklead.

WORK IS TO BE STARTED ALMOST IMMEDIATELY on a new mining venture in County Waterford, Irish Free State, the mineral rights in respect of which, over an area of twelve square miles, and embracing the site of the old Bonmahon Copper Mines, are being sought by an international group of industrialists. The decision to commence work was announced by Mr. Arthur Broughton Broughton-Edge at a sitting of the Mining Board in Dublin. Mr. Nils Erik Lenander, Norway, and Mr. Lawrence Austen Impey, Oxford, are with Mr. Broughton-Edge in the project.

MR MILNER GRAY, lecturer on advertisement design, styling and packaging at Goldsmiths' College, University of London, and chairman of Industrial Design Partnership, said that the package had become one of the most important links in the chain of presentation and merchandising when he spoke to the Institute of Export on Tuesday. The subject of Mr. Gray's address was "New Ideas on Packaging for Export." He suggested that many of the ideas which were of value in selling at home would also be of value in selling abroad. Packaging for export brought its own special problems and the differences between the home and export fields might be far reaching, but their ultimate aim was that of pleasing the consumer and winning his continued confidence and support. Mr. Gray dealt with contemporary package design, the designers, printers and suppliers who produce the package, and the many advantages that a well-designed pack offered to the manufacturer wishing to gain a hold in a foreign field.

THE PRIME MINISTER has nominated the following official delegates to represent the Government at the third World Power Conference and second congress, International Commission on Large Dams of the World Power Conference, to be held currently in Washington, D.C., between September 7 and 12, by invitation of the American Government: Viscount Falmouth, Mr. N. G. Gedye, O.B.E., Mr. T. Hardie (Gas Light and Coke Company), Mr. J. M. Kennedy, O.B.E. (president of the Institution of Electrical Engineers), Dr. F. M. Lea (Building Research Station), Mr. Charles H. Merz, Sir Archibald Page (chairman, Central Electricity Board), Mr. C. Rodgers, O.B.E., Dr. F. S. Sennett, C.B. (Director of Fuel Research), and Mr. E. T. Williams, O.B.E. The total British participation will exceed 100 persons. The final time table for the conference has now been announced. The joint opening session will be held in Constitution Hall, Washington, on September 7 at 8.30 p.m. Business sessions will be held earlier on the same day and throughout the week. There will be an address by the President of the United States on September 11.

## Chemical and Allied Stocks and Shares

**O**WING to holiday influences the stock and share markets have been a good deal less active this week. Profit-taking was in evidence among iron, steel and other shares which had risen strongly recently, but in many cases a good part of their advance of the previous week was held, and a steady undertone was maintained. Shares of chemical and associated companies were again steady. B. Laporte lost some of their recent advance, but at the time of writing the lower price does not seem to have been tested by much business. Imperial Chemicals were more active and more attention was given to Fison, Packard and Prentice on the apparently satisfactory yield offered and on the hope of a further increase in dividend. For the previous year the dividend was raised from 7½ per cent. to 9 per cent., and following the agreement with the Imperial Smelting Corporation the company received £10,000 for goodwill in the West of England, which sum was applied in writing down the value of fixed assets. Imperial Smelting ordinary shares have continued more active on more general anticipations that dividends are likely to be resumed this year. The 2s. shares of British Industrial Plastics have been in larger demand around 4s., there being hopes in the market of an increase in dividend to 9 per cent. and talk of the possibility of plastics being used on a much larger scale in future in the making of accessories for the motor trade. The 5½ per cent. preference shares of Monsanto Chemicals changed hands around 22s. 10d. They are well covered as to dividend, for the last report showed that whereas net profits were £111,066, the preference dividend required only £16,992. Distillers were rather lower at 102s. and United Molasses at 23s. 4½d. have lost part of their recent rise, although the market is continuing to budget for a favourable increase in the dividend of the latter company. Unilever were good at around 36s., the recently-announced plans for merging margarine manufacturing facilities in this country having created a good impression in the market and tended to increase hopes of a larger dividend.

Paint shares have been in rather better demand, particularly International Paint, which were assisted by the belief that this company is likely to benefit from better activity in shipbuilding and shipping as it is an important manufacturer of ships' paints. Lewis Berger and Pinchin Johnson were also in request, but at the time of writing they show no important change in price as

compared with a week ago. Greff Chemical Holdings 5s. ordinary shares remained steady at 9s. 3d., and the 10s. preference were also unchanged at 11s. 4½d. There was a good deal of profit-taking in British Oxygen following their recent large rise and they are now back to 11s. The reaction does not, of course, indicate that less favourable views are current as to the possibility of a good increase in the dividend, but is merely a reflection of the less active general market conditions. The 5s. ordinary shares of United Premier Oil and Cake changed hands freely around 11s. 6d. and British Oil and Cake Mills preferred units were firm at 49s. 4½d.

The latter carry participating dividend rights. Their maximum dividend is 12½ per cent., payment of which is regarded in the market as virtually guaranteed by Unilever, as on one occasion in the past when profits did not permit of the payment of the maximum dividend a sum sufficient to bring the dividend up to 12½ per cent. was provided by Unilever. Lever Brothers preference have again been active and have held up well. As usual they have remained among the most active preference shares in the industrial list. International Nickel were higher in response to the general improvement in internationally-dealt-in shares which move rather closely with New York market conditions. Boots Pure Drug were little changed at 53s. 9d. The market is now of the opinion that, in view of the conservative policy followed by the directors, there may be no early bonus distribution, but it is still said to be possible that if any further large expansion of business is in prospect there may be another offer of shares to shareholders on favourable terms. It has to be remembered, however, that the large growth of the business has been provided for in the past almost entirely out of the company's resources, and that this will probably be the case in the future as far as possible. Timothy Whites and Taylors remained at 29s. 9d. The market is looking for an increase over last year's 22½ per cent. dividend as it is assumed that fuller benefits are being derived from the amalgamation represented by the company. Associated Portland Cement and other cement shares were active although at slightly lower prices than a week ago. Tarmac and other shares of companies which should benefit from the bigger demand expected for road making and surfacing materials were again in steady request. Oil shares remained more active.

## Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### Specifications Open to Public Inspection

ANTI-CORROSION COATING-COMPOSITIONS.—Chemische Fabrik R. Baumheier, A.-G. Jan. 19, 1935. 27795/35.

PROCESS FOR THE ABSORPTION, in highly-concentrated nitric acid, of nitrous gases formed by the combustion of ammonia.—Bamag-Meguin, A.-G. Jan. 19, 1935. 27982/35.

PREPARATION OF ACETIC ANHYDRIDE.—Consortium Für Elektro-Chemische Industrie Ges. Jan. 16, 1935. 36033/35.

DEVICE FOR TREATING THIXOTROPES.—I. G. Farbenindustrie. Jan. 18, 1935. 1098/36.

HARD WAX or resin-like condensation products.—Deutsche Hydrierwerke, A.-G. Jan. 16, 1935. 1472/36.

CHROME TANNING.—I. G. Farbenindustrie. Jan. 19, 1935. 1591/36.

POLYMERISATION PRODUCTS.—Chemische Forschungsges. Jan. 19, 1935. 1691/36.

RECOVERY OF SOLVENTS, more particularly in the de-paraffination of hydrocarbon mixtures.—Edeleanu Ges. Jan. 18, 1935. 1832/36.

### Specifications Accepted with Date of Application

POLYMERISATION OF UNSATURATED ORGANIC COMPOUNDS.—Dr. O. Röhm. April 7, 1934. 450,305.

DISTILLATION OR HEAT TREATMENT of solid carbonaceous materials, especially briquettes.—British Coal Distillation, Ltd., R. D. Hardy, C. Machen, and E. H. G. Aram. Nov. 9, 1934. 450,240.

TREATMENT OF LIQUIDS AND GASES by absorption, in particular the treatment of liquids for the removal or exchange of anions.—B. A. Adams, and E. L. Holmes. Nov. 13, 1934. 450,309.

NITROGENOUS CONDENSATION PRODUCTS.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Dec. 10, 1934. 450,244.

PLASTIC COMPOSITIONS.—Carborundum Co. Dec. 11, 1933. 450,445.

MANUFACTURE OF FORMALDEHYDE.—J. Francon. Jan. 5, 1935. 450,449.

CARBON BLACK.—W. B. Wiegand. Jan. 8, 1935. 450,450.

CHROMIFEROUS DYESTUFFS.—W. W. Groves (I. G. Farbenindustrie). Jan. 10, 1935. 450,357.

METHOD AND APPARATUS for the bleaching of bast fibres.—I. G. Farbenindustrie. Jan. 20, 1934. 450,253.

RECOVERY OF ALGINIC MATERIAL FROM SEAWEED.—V. C. E. Le Gloahec, and J. R. Herter. Jan. 11, 1934. 450,358.

MANUFACTURE OF ACRIDINIUM COMPOUNDS.—I. G. Farbenindustrie. Jan. 13, 1934. 450,254.

ORGANIC MERCURY-SILICON COMPOUNDS.—I. G. Farbenindustrie. Jan. 20, 1934. 450,256.

MANUFACTURE OF A SUBSTITUTE for wool from viscose.—W. W. Groves (I. G. Farbenindustrie). Jan. 12, 1935. 450,257.

MANUFACTURE OF THE HORMONE of suprarenal cortex.—W. W. Groves (I. G. Farbenindustrie). Jan. 15, 1935. 450,361.

RECOVERY OF COPPER in the manufacture of cuprammonium artificial silk.—A. Carpmael (Duisburger Kupferhutte, and I. G. Farbenindustrie). Jan. 15, 1935. 450,514.

COLOURING OF COPPER and copper alloys.—H. W. Brownsdon, L. C. Bamister, and Imperial Chemical Industries, Ltd. Jan. 15, 1935. 450,459.

CELLULOSE ESTERS.—British Celanese, Ltd., and J. E. Jones. Jan. 16, 1935. 450,408.

ORGANIC CONDENSATION PRODUCTS particularly for the treatment of textiles.—Deutsche Hydrierwerke, A.-G. Jan. 31, 1934. 450,515.

DISTRIBUTION OF FINELY DIVIDED SOLID PESTICIDES.—J. M. McEntegart, and Imperial Chemical Industries, Ltd. Jan. 16, 1935. 450,462.

MANUFACTURE OF ADHESIVES.—I. G. Farbenindustrie. Jan. 16, 1934. 450,414.

AZO DYESTUFFS.—I. G. Farbenindustrie. Jan. 19, 1934. 450,517.

CONDENSATION PRODUCTS of totally hydrolysed protein material.—I. G. Farbenindustrie. Jan. 18, 1934. 450,467.

TREATMENT OF DYEINGS for improving their fastness.—A. Carpmael (I. G. Farbenindustrie). Jan. 22, 1935. 450,475.

REMOVAL OF GASEOUS WEAK ACIDS from gases containing the same.—I. G. Farbenindustrie. Feb. 1, 1934. 450,519.

PROCESS OF PRODUCING HYDROGEN.—E. L. Rinman. Feb. 2, 1935. 450,416.

PURIFIED GERMAL GLAND HORMONE PREPARATIONS.—Schering-Kahlbaum, A.-G. Feb. 9, 1934. 450,325.

ANTI-CORROSIVE COMPOSITIONS.—H. Sutton, L. F. Le Brocq, and W. V. Gilbert. Feb. 20, 1935. 450,328.

PURIFYING, CONDITIONING, AND ATTEMPERATING AIR.—A. G. Leigh. April 2, 1935. 450,340.

AZO DYESTUFFS.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). April 16, 1935. 450,365.

PROCESS FOR DEWAXING HYDROCARBON OILS.—Alco Products, Inc. June 29, 1934. 450,367.

DETERGENT, CLEANSING, EMULSIFYING, SOFTENING AND DISPERSING AGENTS.—Chemical Works, formerly Sandoz. June 5, 1934. 450,368.

CHLORHYDRINES.—Soc. Carbochimique Soc. Anon. April 15, 1935. 450,372.

PRODUCTION AND USE OF BARIUM SOAPS.—C. Deguidi. Dec. 21, 1934. 450,288.

TREATING HYDROCARBON MIXTURES.—Naamlooze Venootschap de Bataafse Petroleum Maatschappij. Feb. 12, 1935. 450,511.

LIGHT COLOURED ENAMELS for direct application to ironware.—E. Rickman. Jan. 9, 1935. 450,349.

MANUFACTURE OF DYESTUFFS.—Soc. of Chemical Industry in Basle. Jan. 24, 1935. 450,391.

### Applications for Patents

(July 9 to 15 inclusive.)

MANUFACTURE OF METALLIFEROUS AZO DYESTUFFS.—Soc. of Chemical Industry in Easle. (Switzerland, July 12, '35) 19376.

MANUFACTURE OF AZO DYESTUFFS.—Soc. of Chemical Industry in Basle. (Switzerland, July 12, '35) 19377; June 27, 19378.

MANUFACTURE OF INDIGOID DYESTUFFS.—Soc. of Chemical Industry in Basle. (Switzerland, July 15, '35) 19650.

(July 16 to 22 inclusive.)

PROCESS FOR EVAPORATING LIQUIDS.—Aktiebolaget Kemiska Patentet. (Germany, Aug. 5, 1935. 20228).

PRODUCTION OF PHENOLIC SYNTHETIC RESINS.—Bakelite, Ltd. (United States, March 13). 20,111.

MANUFACTURE OF POLY-ESTER-AMINO RESINS.—S. Bakonyi. (Germany, July 19, 1935.) 20,094.

MANUFACTURE OF DYESTUFF INTERMEDIATES.—J. G. Bedford, Yorkshire Dyewares and Chemical Co., Ltd. (May 11.) 20,314.

PRODUCTION OF SUSPENSIONS OF PIGMENTS.—British Titan Products Co., Ltd. (France, July 26, 1935.) 20,326.

MANUFACTURE OF HYDROGENATED PHENOLS.—M. M. Brubaker, B. W. Hawk. 19794.

TITANIUM DIOXIDE PIGMENTS.—A. Carpmael (I. G. Farbenindustrie). 19,758.

MANUFACTURE OF CONDENSATION PRODUCTS OF PHENANTHRENE SERIES.—A. Carpmael (I. G. Farbenindustrie). 19,759. 19,988.

MANUFACTURE OF CONDENSATION PRODUCTS FROM COMPOUNDS OF ACETYLENE SERIES.—A. Carpmael (I. G. Farbenindustrie). 19,891.

HORMONES.—A. Carpmael (I. G. Farbenindustrie). 19,892.

MANUFACTURE OF DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie). 19,893. 19,987.

MANUFACTURE OF ANTIMONY OXIDES.—A. Carpmael (I. G. Farbenindustrie). 20,091.

MANUFACTURE OF PLASTIC MASSES.—A. Carpmael (I. G. Farbenindustrie). 20,092.

MANUFACTURE OF HYDROCHLORIC ACID.—A. Carpmael (I. G. Farbenindustrie). 20,199.

MANUFACTURE OF DERIVATIVES OF PHENYLENE-DIAMINES.—A. Carpmael (I. G. Farbenindustrie). 20,200.

TREATMENT OF ORGANIC ACIDS.—H. Dreyfus. 19,859.

PRODUCTION OF ORGANIC COMPOUNDS.—H. Dreyfus. 19,860.

THERMAL DEHYDRATION.—H. Dreyfus. 19,861.

MANUFACTURE OF BORIC ACID ESTERS.—E. I. Du Pont de Nemours and Co., and F. W. Johnson. 19,793.

MANUFACTURE OF HYDROGENATED PHENOLS.—E. I. du Pont de Nemours and F. W. Johnson. 19794.

MANUFACTURE OF NITROGENE-CONTAINING CONDENSATION PRODUCTS.—W. W. Groves (I. G. Farbenindustrie). 19740.

MANUFACTURE OF CONDENSATION PRODUCTS.—W. W. Groves (I. G. Farbenindustrie). 20,335.

MANUFACTURE OF POLYMERISATION PRODUCTS.—B. J. Babgood, L. B. Morgan. 20,128.

CATALYSIS.—Houdry Process Corporation. (United States, Aug. 27, 1935.) 20,126.

PRODUCTION OF PLASTIC MASSES FROM ORGANIC COLLOIDS.—I. G. Farbenindustrie. (Germany, July 17, 1935.) 19,874.

MANUFACTURE OF VAT DYESTUFFS.—I. G. Farbenindustrie. (Germany, July 17, 1935.) 19,895.

MANUFACTURE OF STEROL DERIVATIVES.—I. G. Farbenindustrie (Germany, July 18, 1935.) 20,058.

MANUFACTURE OF HYDROXYCARBOXYLIC ACID.—I. G. Farbenindustrie. (Germany, July 20, 1935.) 20,095.

MANUFACTURE OF COATING COMPOSITIONS.—Imperial Chemical Industries, Ltd., R. B. Waters, R. Hill and E. E. Walker. 19,792.

MANUFACTURE OF NAPHTHALENE DERIVATIVES.—Imperial Chemical Industries, Ltd., and D. A. W. Fairweather. 19,932.

MANUFACTURE OF OILY MATERIALS.—Imperial Chemical Industries, Ltd., and D. W. F. Hardie. 19,933.

BLEACHING WILD SILK.—Imperial Chemical Industries, Ltd., W. B. Hill and B. P. Ridge. 19,934.

MANUFACTURE OF POLYMERISATION PRODUCTS.—Imperial Chemical Industries, Ltd., and R. Hill. 20,128.

OXIDATION REACTIONS.—Imperial Chemical Industries, Ltd., and D. Tyer. 20,233.

CHEMICAL REACTIONS.—Imperial Chemical Industries, Ltd., and R. Hill. 20,234.

HYDROGENATION AND DEHYDROGENATION ACTIONS.—Imperial Chemical Industries, Ltd., and R. Hill. 20,235.

ELIMINATION OF OXYGEN AND/OR HYDROGEN FROM GASEOUS MIXTURES.—Imperial Chemical Industries, Ltd., and M. Polyani. 20,236.

DYEING OF TEXTILES.—Imperial Chemical Industries, Ltd., and H. A. Thomas. 20,348.

MANUFACTURE OF PLASTIC MASSES.—Imperial Chemical Industries, Ltd., and N. Bennett. 20,349.

ANTHRAQUINONE DERIVATIVES.—Imperial Chemical Industries, Ltd., G. C. Semple and C. Shaw. 20,350.

POLYMERISATION OF DRYING OILS.—Imperial Chemical Industries, Ltd., C. V. Vlodrop and H. L. Waterman. 20,352.

### Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

**South Africa.**—The British Trade Commissioner at Johannesburg reports that the Johannesburg Hospital is calling for tenders, to be presented in South Africa by September 19, for the supply of chemicals, drugs, dispensary equipment and surgical dressings. Local representation is essential. A copy of the complete schedule and general conditions of tender can be inspected by United Kingdom firms at the Department of Overseas Trade (Room 35a) until August 5, after which date the documents will become available for loan to firms in order of application. (Ref. T.Y. 40137.)

**Monte Video.**—The British Consul at Monte Video reports that the State Electricity Supply and Telephone Administration in that city is calling for tenders, to be presented in Monte Video by August 26, for the supply of 5,000 kilogs of pure tin in ingots. (Ref. T.Y. 30581.)

### Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

#### Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

HERBERT GREEN AND CO., LTD., London S.W., petroleum refiners, etc. (M. 1/8/36.) July 20. £30,000 debentures, part of £50,000 already registered. \*£150,000. September 6, 1935.

LAFARGE ALUMINOUS CEMENT CO., LTD., London, W.C. (M. 1/8/36.) July 17, £35,000 debenture, to A. Ruffer and Sons, Ltd.; general charge. \*£12,118. October 9, 1935.

NORTH BRITISH RAYON, LTD., London, E.C. (M. 1/8/36.) July 16, two dispositions supplemental to Trust Deed dated June 25, 1936; charged on properties at Jedburgh, etc.; also July 16, debenture, to Mosley Street Nominees, Ltd., securing all moneys due or to become due to Williams Deacon's Bank, Ltd., from the company (provided such indebtedness shall not exceed £50,000 without the consents mentioned in said debenture); 1st charge over stock in trade and book debts of company for the time being, both present and future. \*£101,568. November 14, 1935.

#### Satisfaction

ANGLO-CONTINENTAL GUANO WORKS, LTD., London, E. (M.S., 1/8/36.) Satisfaction July 16, of Trust Deeds registered February 9, 1923, January 4, 1926, and May 10, 1932.

#### Partnership Dissolved

JACKSON AND KEDGE (John Alexander Jackson and Frederick William Henry Kedge), wholesale manufacturing chemists and druggists, 10 Belvedere Buildings, London, S.E.1, by mutual consent, July 25, 1936. Debts received and paid by John Alexander Jackson. The business will be carried on in the future by John Alexander Jackson.

## Weekly Prices of British Chemical Products

**T**HERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates. In the coal tar products section there has been a further advance in cresylic acid and a slight reduction in 90 per cent. toluol. In the pharmaceutical market the price of Seidlitz powder (pulverised) has been reduced by 4s. per cwt. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

**MANCHESTER.**—Conditions have been relatively quiet on the Manchester chemical market during the past week. The holiday season is now about at its height and is having an unmistakable influence both upon the volume of new buying, which this week has been only on moderate scale, and also upon the rate at which chemicals and allied products, including those descriptions used in Lancashire in the dyeing, bleaching and kindred industries are moving into consumption against contracts. Apart from this seasonal influence, the underlying conditions at the consuming end of the trade are regarded as satisfactory and sellers on the

Manchester market are looking forward to an active business when the holiday season is over. Price movements this week in either one direction or the other have been narrow.

**GLASGOW.**—Business in general chemicals has been rather quiet during the week on account of the local holidays, and export business has also been limited. Prices, however, continue very steady at about previous figures with no important changes to report. There have been no noteworthy changes in quotations for coal tar products

Inquiries for all grades of cresylic acid continue. Prices tend if anything to advance. While the bulk of deliveries at the moment is under existing contracts, some new business has also been transacted in the 97/99% grades of pale, dark and American specification. The 99/100% grade is more difficult to secure for immediate delivery. Virgin oils are readily sold if the tar acid content is 25 per cent. or over. Naphthas maintain their present price level, the high flashing quality being in steadier demand than the solvent 90/160%.

### Price Changes

**Coal Tar Products.**—CRESYLIC ACID, 99/100%, 3s. 3d. to 3s. 9d. per gal.; Glasgow, 2s. 9d. to 3s.; pale, 97/99%, Glasgow, 2s. 3d. to 2s. 4d. TOLUOL, 90%, 2s. per gal.

**Pharmaceutical and Photographic Materials.**—ATROPINE SULPHATE, 11s. 10d. per oz.; SEIDLITZ POWDER (pulv.), 58s. 9d. to 62s. 6d. per cwt.

### General Chemicals

**ACETONE.**—LONDON: £62 to £65 per ton; SCOTLAND: £64 to £65 ex wharf, according to quantity.

**ACID, ACETIC.**—40% technical, £16 12s. 6d. per ton. LONDON: Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £32 5s. to £34 5s.; tech., 40%, £16 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £32 5s.; tech., 80%, £30 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £48 to £50.

**ACID, BORIC.**—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, in 1 cwt. bags, £28; powdered, in 1 cwt. bags, £29.

**ACID, CHROMIC.**—Flaked, 10d. per lb., less 2½%; ground, 10½d. per lb., less 2½%, d/d U.K.

**ACID, CITRIC.**—1s. per lb. MANCHESTER: 1s. SCOTLAND: B.P. crystals, 1s. per lb. less 5%.

**ACID, CRESYLIC.**—97/100%, pale, 2s. 10d. to 2s. 11d. per gal; 99/100%, refined, 3s. 3d. to 3s. 9d. per gal.

**ACID, FORMIC.**—LONDON: £42 to £47 per ton.

**ACID, HYDROCHLORIC.**—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

**ACID, LACTIC.**—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £30: pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

**ACID, NITRIC.**—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

**ACID, OXALIC.**—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: £2 10s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.

**ACID, SULPHURIC.**—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

**ACID, TARTARIC.**—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11½d. less 5%. SCOTLAND: 11½d. less 5%. MANCHESTER: 1s. per lb.

**ALUM.**—SCOTLAND: Ground, £10 2s. 6d. per ton; lump, £9 12s. 6d.

**ALUMINA SULPHATE.**—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

**AMMONIA, ANHYDROUS.**—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

**AMMONIA, LIQUID.**—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

**AMMONIUM BICHROMATE.**—8d. per lb. d/d U.K.

**AMMONIUM CARBONATE.**—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

**AMMONIUM CHLORIDE.**—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

**AMMONIUM CHLORIDE (MURIATE).**—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

**AMMONIUM SULPHATE.**—Neutral quality, 20.6% nitrogen, £7 per ton.

**ANTIMONY OXIDE.**—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

**ANTIMONY SULPHIDE.**—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

**ARSENIC.**—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £17 10s. ex store. MANCHESTER: White powdered Cornish £20 10s. ex store.

**ARSENIC SULPHIDE.**—Yellow, 1s. 5d. to 1s. 7d. per lb.

**BARIUM CHLORIDE.**—LONDON: £10 10s. per ton. SCOTLAND: £11.

**BARYTES.**—£6 10s. to £8 per ton.

**BISULPHITE OF LIME.**—£6 10s. per ton f.o.r. London.

**BLEACHING POWDER.**—Spot, 35/37%, £7 19s. per ton in casks, special terms for contract. SCOTLAND: £9.

**BORAX, COMMERCIAL.**—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots. SCOTLAND: Granulated, £14 10s. per ton in 1 cwt. bags, carriage paid.

**CADMUM SULPHIDE.**—3s. 10d. to 4s. 1d. per lb.

**CALCIUM CHLORIDE.**—Solid 70/75%, spot, £5 5s. per ton d/d station in drums. SCOTLAND: £5 10s. per ton net ex store.

**CARBON BISULPHIDE.**—£31 to £33 per ton, drums extra.

**CARBON BLACK.**—3½d. to 4½d. per lb. LONDON: 4½d. to 5d.

**CARBON TETRACHLORIDE.**—SCOTLAND: £41 to £43 per ton, drums extra.

**CHROMIUM OXIDE.**—10½d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

**CHROMETAN.**—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d COPPERS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

**CREAM OF TARTAR.**—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 18s. net.

**DINITROTOLUENE.**—66/68° C., 9d. per lb.

**DIPHENYLGUANIDINE.**—2s. 2d. per lb.

**FORMALDEHYDE.**—LONDON: £24 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

**IODINE.**—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

**LAMPBLACK.**—£26 to £28 per ton.

**LEAD ACETATE.**—LONDON: White, £33 15s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £34, brown £33.

**LEAD NITRATE.**—£32 10s. to £34 10s. per ton.

**LEAD, RED.**—SCOTLAND: £31 per ton less 2½%, carriage paid, LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £41.

**LITHOPONE.**—30%, £16 5s. to £16 10s. per ton.

**MAGNESITE.**—SCOTLAND: Ground calcined, £9 per ton, ex store.

**MAGNESIUM CHLORIDE.**—SCOTLAND: £6 17s. 6d. per ton.

**MAGNESIUM SULPHATE.**—Commercial, £5 per ton, ex wharf.

**METHYLATED SPIRIT.**—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

**PARAFFIN WAX.**—SCOTLAND: 3½d. per lb.

**PHENOL.**—6½d. to 7½d. per lb.

**POTASH, CAUSTIC.**—LONDON: £42 per ton. MANCHESTER: £39.

**POTASSIUM BICHROMATE.**—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. per lb. less 5% carriage paid. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 4d. per lb. MANCHESTER: £38 per ton.

POTASSIUM CHROMATE.—6d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 6s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8d. per lb. SCOTLAND: B.P. Crystals, 8d. MANCHESTER: B.P. 11d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 7d. to 8d. per lb. SCOTLAND: 7d. net, ex store. MANCHESTER: Yellow, 8d. to 8d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON: £21 per ton. SCOTLAND: £17 15s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: £12 10s. per ton in 1 cwt. kegs, £10 15s. per ton in 2 cwt. bags. MANCHESTER: £10 10s.

SODIUM BICHLORATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. SCOTLAND: 4d., less 5% carriage paid.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£29 per ton. SCOTLAND: £1 10s. per cwt.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographie, £14 10s.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5d. per lb. SCOTLAND: 5d. to 5d. ex store. MANCHESTER: 5d. to 5d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d. to £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £15 per ton f.o.b. SCOTLAND: £16 10s. per ton less 5%.

SULPHUR.—£9 to £9 5s. per ton. SCOTLAND: £8 to £9.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality. COMMERCIAL, £55 to £60 per ton according to quantity.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

### Coal Tar Products

ACID, CRESYLIC.—97/99%, 2s. 10d. to 2s. 11d. per gal.; 99/100%, 3s. 3d. to 3s. 9d. per gal., according to specification; pale 98%, 3s. to 3s. 1d.; dark, 2s. 4d. to 2s. 5d. GLASGOW: Pale, 99/100%, 2s. 9d. to 3s. per gal.; pale, 97/99%, 2s. 3d. to 2s. 4d.; dark, 97/99%, 2s. to 2s. 1d.; high boiling acids, 1s. 9d. to 2s. 3d.; American specification, 2s. 6d. to 2s. 9d.

ACID, CARBOLIC.—Crystals, 6d. to 7d. per lb.; crude, 60's, 2s. 3d. to 2s. 6d. per gal. MANCHESTER: Crystals, 6d. per lb.; crude, 2s. 7d. per gal. GLASGOW: Crude, 60's, 2s. 4d. to 2s. 6d. per gal.; distilled, 60's, 2s. 8d. to 3s.

BENZOL.—At works, crude, 8d. to 9d. per gal.; standard motor 1s. 2d. to 1s. 2½d. 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 7d. to 1s. 7½d. LONDON: Motor, 1s. 3½d. GLASGOW: Crude, 8d. to 9d. per gal.; motor, 1s. 3d. to 1s. 4d.

CREOSOTE.—B.S.I. Specification standard, 5d. per gal. f.o.r. Home, 3d. d/d. LONDON: 4d. f.o.r. North; 5d. London. MANCHESTER: 4d. to 5d. GLASGOW: B.S.I. Specification, 5d. to 5½d. per gal.; washed oil, 4d. to 5d.; lower sp. gr. oils, 4d. to 5d.

NAPHTHA.—Solvent, 90/100%, 1s. 5d. to 1s. 6d. per gal.; 95/160%, 1s. 8d.; 90%, 1s. to 1s. 2d. LONDON: Solvent, 1s. 3d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. GLASGOW: Crude, 5d. to 6d. per gal.; 90% 160, 1s. 4d. to 1s. 5d.; 90% 190, 1s. to 1s. 1d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £16 10s. per ton; purified crystals, £25 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. GLASGOW: Fire lighter, crude, £7 to £8 per ton (bags free).

PYRIDINE.—90/140%, 5s. to 7s. per gal.; 90/180, 2s. 3d. GLASGOW: 90% 140, 6s. to 6s. 6d. per gal.; 90% 160, 5s. to 5s. 6d.; 90% 180, 2s. 6d.

TOLUOL.—90%, 2s. per gal.; pure, 2s. 4d. GLASGOW: 90% 120, 1s. 11d. to 2s. per gal.

XYLOL.—Commercial, 2s. 1d. per gal.; pure, 2s. 3d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

PITCH.—Medium, soft, 35s. to 36s. per ton, in bulk at makers works. MANCHESTER: 32s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 32s. 6d. to 35s. per ton; in bulk for home trade, 32s. 6d.

### Nitrogen Fertilisers

SULPHATE OF AMMONIA.—August, £6 14s. 6d. per ton; September, £6 16s.; October, £6 17s. 6d.; November, £6 19s.; December, £7 0s. 6d. for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

MANCHESTER: Brown, £9; grey, £10 10s.

CALCIUM CYANAMIDE.—August, £6 15s. per ton; September, £6 16s. 3d.; October, £6 17s. 6d.; November, £6 18s. 9d.; December, £7: carriage paid to any railway station in Great Britain in lots of 4 tons and over.

NITRO-CHALK.—£7 5s. per ton to end of September.

NITRATE OF SODA.—£7 12s. 6d. per ton to end of September.

CONCENTRATED COMPLETE AND AMMONIUM PHOSPHATE FERTILISERS.—Prices have not yet been fixed and at present it is impossible to give any indication as to the date of any announcement or of the trend of prices.

### Wood Distillation Products

ACETATE OF LIME.—Brown, £8 to £8 10s. per ton; grey, £10 5s. to £10 15s. Liquor, brown, 30° Tw., 8d. per gal.

MANCHESTER: Brown, £9; grey, £10.

CHARCOAL.—£5 to £10 per ton, according to grade and locality.

METHYL ACETONE.—40-50%, £45 to £48 per ton.

WOOD CREOSOTE.—Unrefined 6d. to 1s. 6d. per gal., according to boiling range.

WOOD, NAPHTHA, MISCELL.—2s. 9d. to 3s. 3d. per gal.; solvent, 3s. 9d. per gal.

WOOD TAR.—£2 to £2 10s. per ton.

### Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHROP.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free

*o*-CRESOL 30/31° C.—6d. per lb., in 1-ton lots.

*p*-CRESOL 34-5° C.—1s. 6d. per lb., in ton lots.

*m*-CRESOL 98/100%—1s. 7d. per lb. in ton lots.

DICHLORANILINE.—1s. 11d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUOLE.—48/50° C., 9d. per lb.; 66/68° C., 10d.

DINITROCHLOROBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

*α*-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

*β*-NAPHTHOL.—In bags, £88 15s. per ton; in casks, £89 15s.

*α*-NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 0½d.

*β*-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

*α*-NITRANILINE.—3s. 11d. per lb.

*m*-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

*p*-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4d. to 5d. per lb.; 5-ewt. lots, drums extra

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

*o*-TOLUIDINE.—9d. to 11d. per lb.

*p*-TOLUIDINE.—1s. 11d. per lb.

(For latest oil prices see page 110.)

## Company News

**Solignum.**—The report of Solignum for 12 months to March 31 last shows profit £6,082. To this is added £171 brought in, making £6,253. Preference dividend absorbed £4,920, to reserve £1,000, leaving £333 forward.

**Gas Light and Coke Co.**—The directors announce the maintenance of the ordinary dividend at £2 16s. per cent. The half-year payments on the 4 per cent. consolidated preference stock and 3½ per cent. maximum stock are also announced.

**English Velvet and Cord Dyers' Association.**—It is announced that the consideration of preference and ordinary dividends for the half-year ended June 30 last has been deferred. No preference dividend was paid for 1935, and last ordinary dividend was 4 per cent. for 1931.

**Pharmaceutical Products.**—The accounts for the year to end of March show trading profit, after administration and other charges, of £5,904. To this is added interest £3,266, amounts written off publicity expenditure (during period April 5, 1933, to March 31, 1935, now written back) £11,420, and £892 brought in, making £21,483. Directors' fees took £500, depreciation £90, interest on loan to subsidiary waived £3,506, and reserve for doubtful debts £300, leaving £17,087 (£10,017). Preference dividends for year absorbed £8,125, to preliminary expenses £1,000, leaving £7,962 forward.

**Lancegate Safety Glass.**—Trading profits of £7,607 are reported for the year to March 31 last, compared with £6,832 in the previous period March 23, 1934, to March 31, 1935. Research and laboratory expenses were reduced from £1,017 to £333 and £593, against £457, was placed to depreciation. After allowing for directors' fees, bank charges, etc., the net profit amounts to £5,435, compared with £1,028. This is exclusive of profits earned by a subsidiary, which for the period to March 31 last amounted to £2,251. The amount available after providing for tax is £5,692, and it is proposed to pay a final dividend of 3½ per cent., making 6 per cent. for the year, which will absorb £5,280, leaving £112 to go forward. In the previous year the total distribution was 5 per cent. Meeting, Winchester House, E.C.2, August 3, at 12 noon.

**Associated Clay Industries.**—A profit of £20,742 is reported for the year to March 31 last, against £21,077 in the previous twelve months. Adding £8,020 brought in and £265 tax over-reserved in previous years, there is an available balance of £29,028. Dividend on the 7½ per cent. preference shares, less tax, for the twelve months to end December last, took £10,172, and £10,000 is placed to reserve, leaving £8,856 forward. To provide for the acquisition of Joseph Place and Sons and to obtain further working capital it is proposed to make an issue of £150,000 of 4½ per cent. debenture stock. The half-year's interest on the preference shares due at June 30, 1936, was not paid, as it was deemed advisable to conserve the liquid resources. Payment of this interest will be practicable when the company has secured the funds to meet the demands of the business. A separate meeting of the preference shareholders was held on Wednesday, when approval was given to the new issue of debenture stock, followed by the annual general meeting at which the report and accounts were adopted.

## New Companies Registered

**Roberts Patent Filling Machine Co., Ltd.**, Deane Road, Bolton, Lancs.—Registered July 27. Nominal capital, £12,000. To acquire the business of a manufacturer of filling machinery carried on by Thomas Roberts at Deane Road, Bolton, as "Roberts Patent Filling Machine Co." and to carry on the business of manufacturers of and dealers in bottle filling and other machinery. Directors: Sir Wm. Edge and Knowles Edge.

**Victor Wolf, Ltd.**, Victoria Works, Croft Street, Clayton, Manchester—Registered July 21. Nominal capital, £15,000. Manufacturers, refiners, distillers and producers of fatty acids, glycerine, oils, greases, soaps, fats, chemicals, salts, glues, waxes, spirits, lubricants, paints, colours, dyes, pigments, etc. Directors: Max Wolf, Arnold Wolf and Rudolf Wertheim.

## Books Received

**Perfumes, Cosmetics and Soaps.** Vol. 3. By W. A. Poucher. Pp. 228. 21s.

**Alkali, etc., Works, Seventy-Second Annual Report.** Proceedings During the Year 1935. London: H.M. Stationery Office. Pp. 43. 9d.

**Annual Survey of American Chemistry.** Vol. X. Edited by Clarence J. West. New York: Reinhold Publishing Corporation. London: Chapman and Hall, Ltd. Pp. 487.

## New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

**Beckosol.** 560,923; **Beckacite.** 560,922. Artificial resins being chemical substances for use in the manufacture of paints, varnishes and the like. Beck, Koller and Co. (England), Ltd., 479 Edge Lane, Liverpool. June 18, 1935.

**Ionol.** 556,716. Chemical substances for use in emulsifying oil in the course of manufacture. Montgomerie, Stobo and Co., Ltd., 52 to 72 Rogart Street, Bridgeton, Glasgow, S.E. December 28, 1934.

**Refractite.** 560,433. China clay. English Clays, Lovering Pochein and Co., Ltd., 14 High Cross Street, St. Austell, Cornwall. May 24, 1935.

**Thuridin.** 558,699. Chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes. British Dyestuffs Corporation, Ltd., Imperial Chemical House, Millbank, London, S.W.1, manufacturers; and The British Drug Houses, Ltd., 16 to 32 Graham Street, City Road, London, N.1. March 11, 1935.

**Cericlor.** 560,442. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1. May 24, 1935.

**Cail.** 559,963. Chemical substances used in manufactures, or philosophical research, and anti-corrosives, but not including preparations for prevention or removal of scale in boilers and the like, and not including any goods of a like kind to these excluded goods. Coal and Allied Industries, Ltd., 14 Leadenhall Street, London, E.C.3. May 7, 1935.

**Autowa.** 559,904. Chemical substances for steeping, colouring and brightening textile fabrics and leather in the course of their manufacture. Böhme Fettchemie-Gesellschaft Mit Beschränkter Haftung, Moritzstrasse 25-33, Chemnitz, Saxony, Germany. May 2, 1935. Address for service in the United Kingdom is c/o H. Douglas Elkington, 20-23 Holborn, London, E.C.1.

**Tabanol.** 560,543. Chemical substances for steeping, colouring and brightening textile fabrics and leather in the course of their manufacture. Böhme Fettchemie-Gesellschaft Mit Beschränkter Haftung, Moritzstrasse 25-33, Chemnitz, Saxony, Germany. May 29, 1935. Address for service in the United Kingdom is, c/o H. Douglas Elkington, 20 to 23 Holborn, London, E.C.1.

**Glycedur.** 560,637. Solvents, softeners and plasticisers, being chemical substances for use in manufactures. The Geigy Colour Co., Ltd., National Buildings, Parsonage, Manchester, 3. June 4, 1935.

**Appretan.** 560,753. All goods included in Class I. I. G. Farbenindustrie, Grüneburgplatz, Frankfort-on-Main, Germany. June 7, 1935. Address for service in the United Kingdom is, c/o Abel and Imray, 30 Southampton Buildings, London, W.C.2.

**Fixapret.** 560,754. Chemical substances for use as dressing and finishing agents for textile fabrics in the course of manufacture. I. G. Farbenindustrie, Grüneburgplatz, Frankfort-on-Main, Germany. June 7, 1935. Address for service in the United Kingdom is, c/o Abel and Imray, 30 Southampton Buildings, London, W.C.2.

**Medialan.** 561,659. Chemical substances for use in the treatment of textile fabrics in the course of manufacture. I. G. Farbenindustrie Aktiengesellschaft, Grüneburgplatz, Frankfort-on-Main, Germany. July 19, 1935. Address for service in the United Kingdom is c/o Abel and Imray, 30 Southampton Buildings, London, W.C.2.

## Latest Oil Prices

**LONDON.** July 29.—**LINSEED OIL** was steady. Spot, £29 per ton (small quantities), Aug., Sept.-Dec., and Jan.-April, £26 10s., naked. **SOYA BEAN OIL** was quiet. Oriental (bulk), spot, Rotterdam, £24 10s. per ton. **RAPE OIL** was steady. Crude, extracted, £34 10s. per ton; technical refined, £35 10s., naked, ex wharf. **COTTON OIL** was very firm. Egyptian crude, £27 10s.; refined common edible, £31; and deodorised, £33; naked, ex mill (small lots £1 10s. extra). **TURPENTINE** was again easy. American, spot, 39s. 3d. per cwt.

**HULL.**—**LINSEED OIL**.—Spot, quoted £27 10s. per ton; July, £26 17s. 6d.; Aug., £26 15s.; Sept.-Dec., £26 12s. 6d.; Jan.-April, £26 7s. 6d. **COTTON OIL**.—Egyptian, crude, spot, £28 10s. per ton; edible, refined, spot, £30 5s.; technical, spot, £30 5s.; deodorised, £32 5s., naked. **PALM KERNEL OIL**.—Crude, f.m.q., spot, £23 per ton. **GROUNDNUT OIL**.—Extracted, spot, £33 per ton; deodorised, £36. **RAPE OIL**.—Extracted, spot, £33 10s. per ton; refined, £34 10s. **SOYA OIL**.—Extracted, spot, £29 10s. per ton; deodorised, £32 10s. **COD OIL**.—F.o.r. or f.a.s., 25s. per cwt., in barrels. **CASTOR OIL**.—Pharmaceutical, 43s. per cwt. Firsts, 38s.; seconds, 36s. **TURPENTINE**.—American, spot, 42s. per cwt.

